GATES LEARJET CORPORATION

maintenance manual

CHAPTER

12

SERVICING

RECORD OF TEMPORARY REVISIONS

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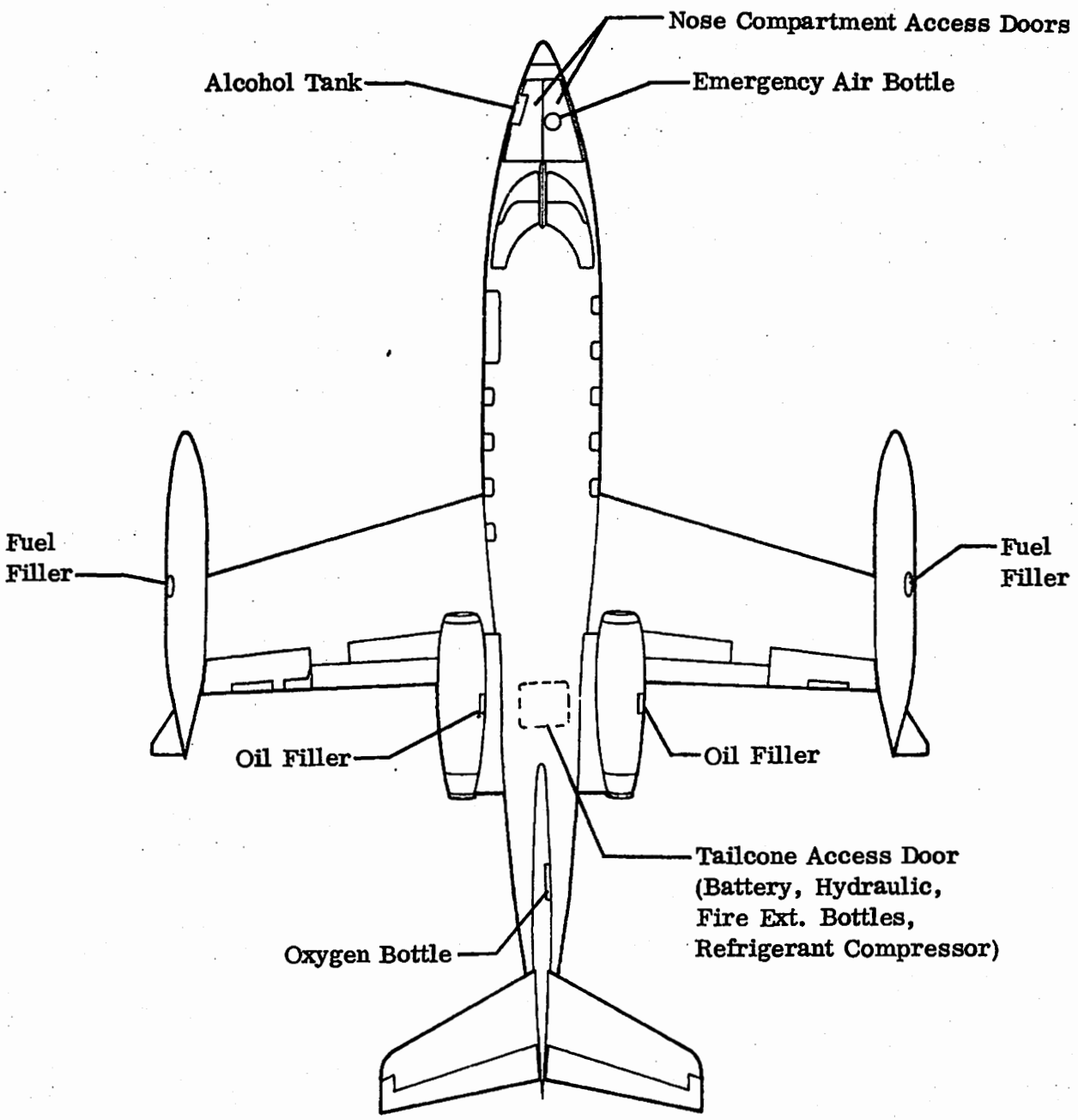
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GENERAL - DESCRIPTION AND OPERATION

1. Description
 A. This chapter consists of descriptions, illustrations and procedures necessary to locate system and component service points and replenish or service those systems or components.
 B. The major service points of the aircraft are shown in figure 1.
 C. For additional information on systems and their components not covered in this chapter, refer to the applicable chapter.
 D. As an aid in servicing systems and their components the following chart has been provided. Quantities are shown in U.S., and Metric measures.



Aircraft Service Points
Figure 1

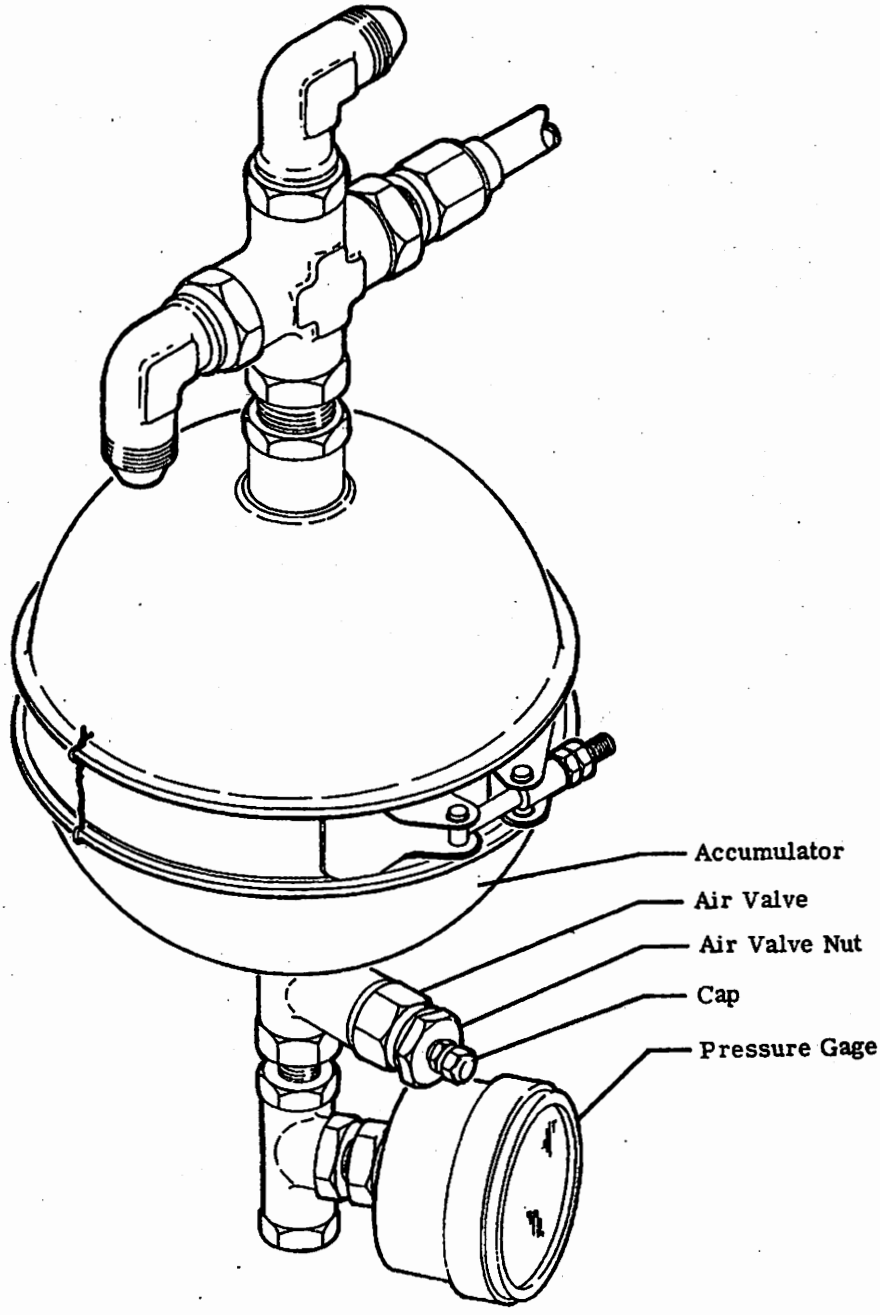
Component or System	Quantity U.S.	Quantity Metric	Name, Number or Type
Hydraulic Accumulator	850 psi		Dry Air or Nitrogen
Hydraulic Reservoir			MIL-H-5606 Hydraulic Fluid
Main Gear Shock Strut			MIL-H-5606 Hydraulic Fluid
Nose Gear Shock Strut			MIL-H-5606 Hydraulic Fluid
Main Gear Shock Strut	283 (±10) psi (Refer to 12-10-04)		Dry Air or Nitrogen
Nose Gear Shock Strut	58 (±3) psi (on jacks)		Dry Air or Nitrogen
Nose Gear Tire	105 (±5) psi (104 to 114 loaded) (Refer to 12-10-05)		Dry Air or Nitrogen
Main Gear Tire	115 (±5) psi (114 to 125 loaded) (Refer to 12-10-05)		Dry Air or Nitrogen
Air Conditioner Compressor	5/8 pint (10 oz.)	18.48 cu. cm	Sunisco No. 3 or Texaco Capella "D" (WF 68)
Refrigeration System	2.9 (±.1) lbs		R-12
Refrigeration System	3.0 lbs (with Sankyo Compressor)		R-12
Emergency Air Bottle	1800 to 3000 psi		Dry Air or Nitrogen
Oxygen Bottle	1800 psi		MIL-O-27210, Type I Breathing Oxygen
Alcohol Tank (25-070 thru 25-226)	2.2 gal.	8.33 liters	O-M-232, Grade A Methyl Alcohol (Methanol)
Alcohol Tank (25-227 & Subsequent)	1.75 gal.	6.62 liters	O-M-232, Grade A Methyl Alcohol (Methanol)
Engine Oil Tank	1.0 gal.	3.78 liters	See GE CJ610 Maintenance Manual SEI-186
Fire Extinguisher Bottle	600 psi		CF_3 BR Extinguishing Agent



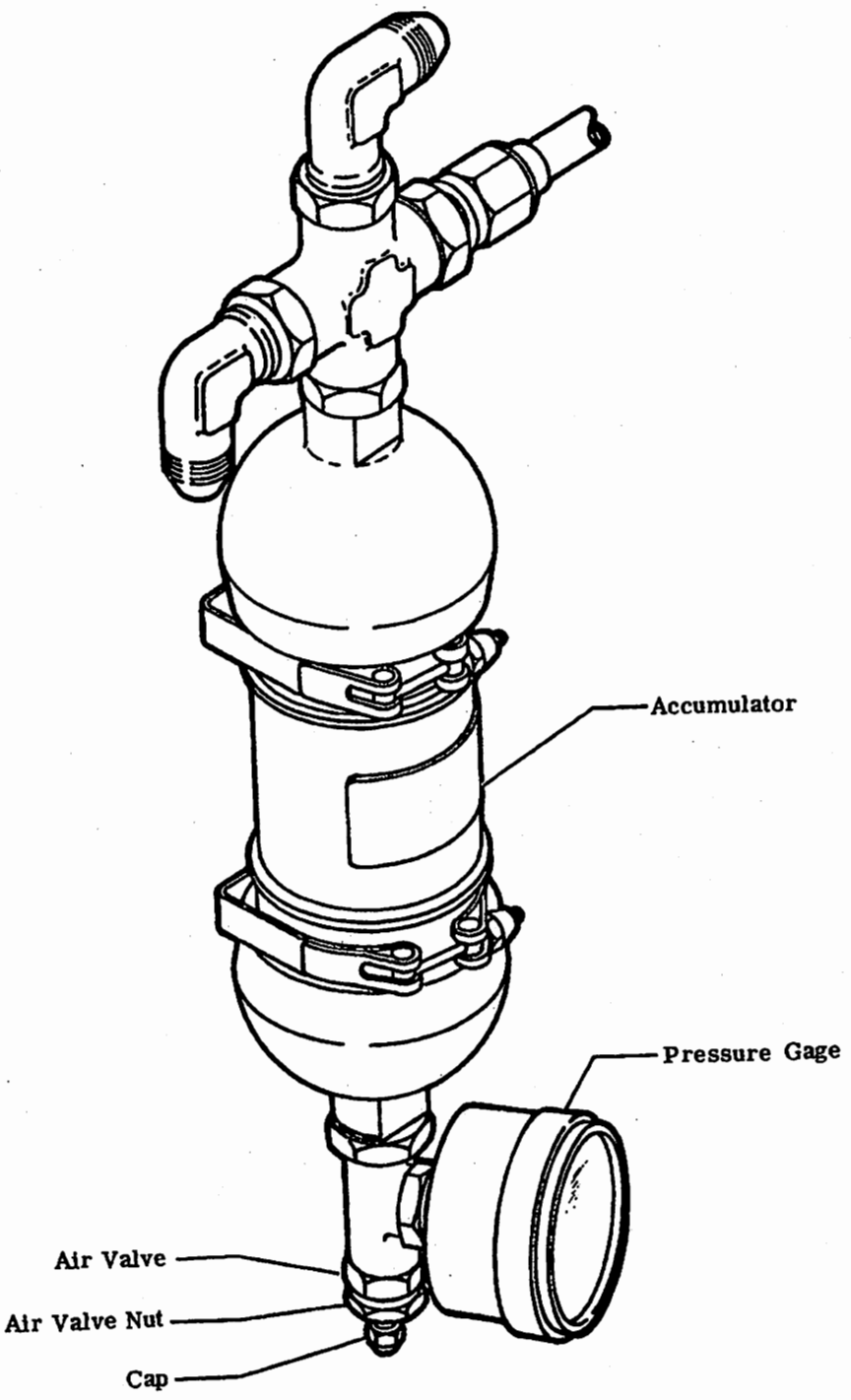
HYDRAULIC ACCUMULATOR - SERVICING

1. General
 A. The hydraulic accumulator is accessible through the tailcone access door.
 B. Service the accumulator with dry air or nitrogen. Moisture in the system can cause system failure during extremely low temperatures.
 C. The accumulator is charged to 850 psi through an air valve. A direct reading pressure gage installed on the air valve gives a pressure reading of the accumulator at all times.

2. Service the Hydraulic Accumulator (See figure 301)
 A. Pressurize the Hydraulic Accumulator
 (1) Bleed residual hydraulic pressure from lines by pumping brakes.
 (2) Set Flap Switch to DN.
 (3) Lower tailcone access door and disconnect batteries.
 (4) Remove cap from air valve and attach high pressure adapter to air valve.
 (5) While pumping brakes, apply pressure to air valve, loosen air valve nut and pressurize accumulator to 850 psi as indicated on accumulator placard. When pressure gage indicates 850 psi, retighten air valve nut.
 (6) Remove high pressure adapter and replace air valve cap.
 (7) Set Flap Switch to UP.
 (8) Connect aircraft batteries and secure tailcone access door.



Hydraulic Accumulator Servicing
Figure 301 (Sheet 1 of 2)



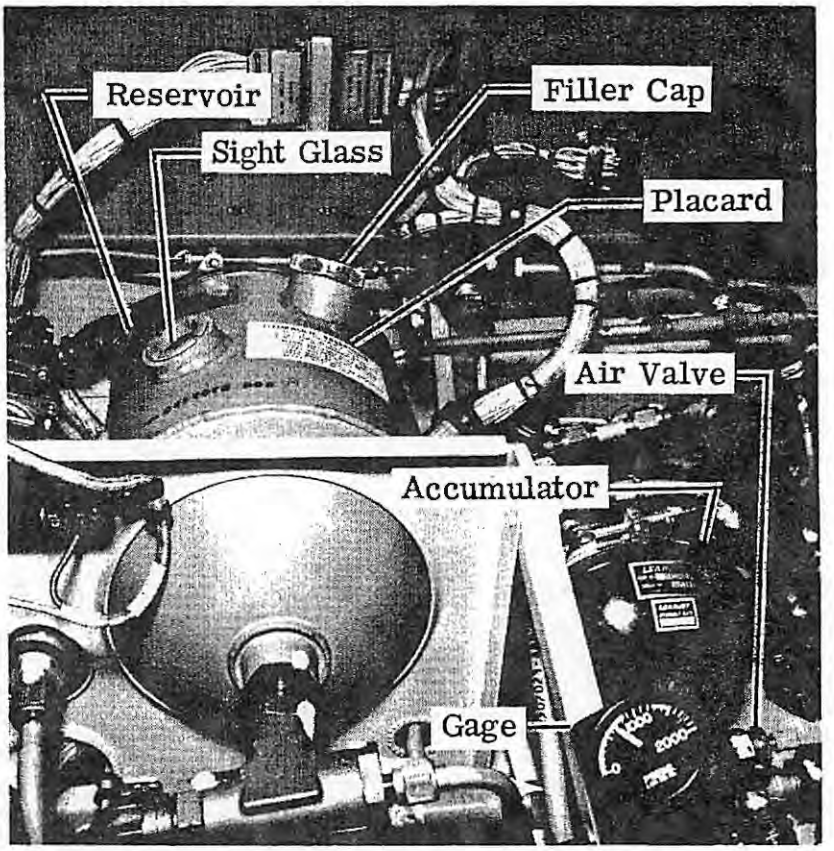
Hydraulic Accumulator Servicing
Figure 301 (Sheet 2 of 2)

HYDRAULIC RESERVOIR - SERVICING

1. General
 A. The hydraulic reservoir is accessible through the tailcone access door. The reservoir incorporates a sight glass which is used in checking fluid level. Reservoir fluid level is low whenever a fluid line is visible through the glass or no fluid is visible through the glass.
 B. Assure that the head pressure in the reservoir is relieved prior to removal of reservoir cap. Failure to do so will result in spewing of hydraulic fluid when cap is removed.
 C. Prior to servicing the reservoir, assure that the hydraulic accumulator has been properly serviced. (Refer to 12-10-01)
 D. When servicing the reservoir the landing gear must be extended, flaps and spoilers retracted, and brakes released.
 E. There are three methods of servicing the hydraulic reservoir, servicing by hand; servicing by pump method and servicing using a hydraulic power unit.
 F. Replenish reservoir fluid with MIL-H-5606 hydraulic fluid.
 G. The reservoir is considered completely full when fluid is level with filler hole.

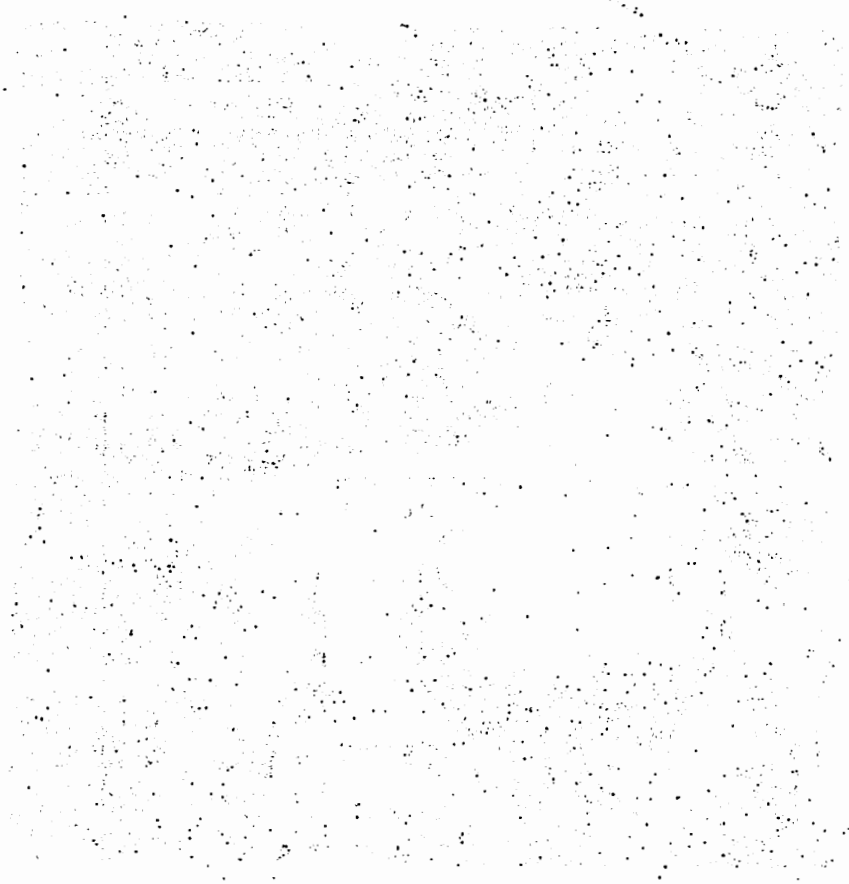
2. Service the Hydraulic Reservoir (See figure 301)
 A. Service the Hydraulic Reservoir by Hand
 (1) Lower tailcone access door and disconnect aircraft batteries.
 (2) Loosen one of the hydraulic line nuts between the hydraulic reservoir and vent valve to bleed off the head pressure in the reservoir. After pressure has been bled, retighten nut.
 (3) Remove filler cap and fill with MIL-H-5606 hydraulic fluid until fluid is level with filler hole. Install and safety wire filler cap.
 (4) Connect aircraft batteries and secure tailcone access door.
 B. Service Hydraulic Reservoir by Pump Method
 (1) Bleed hydraulic pressure from lines by pumping brakes.
 (2) Lower tailcone access door and disconnect aircraft batteries.
 (3) Remove dust cap and connect pump hose quick-disconnect to hydraulic reservoir return line quick-disconnect.
 (4) Loosen one of the hydraulic line nuts between hydraulic reservoir and vent valve to bleed off the head pressure in the reservoir.
 (5) Pump fluid into reservoir to proper level and retighten nut between reservoir and vent valve.
 (6) Disconnect pump from reservoir return line and replace dust cap on aircraft disconnect.
 (7) Connect aircraft batteries and secure tailcone access door.

C. Service Hydraulic Reservoir Using Hydraulic Power Unit
(1) Bleed hydraulic pressure from lines by pumping brakes.
(2) Lower tailcone access door and disconnect batteries.
(3) Remove dust caps and connect hydraulic power unit to aircraft hydraulic quick-disconnects.
(4) Loosen one of the hydraulic line nuts between hydraulic reservoir and vent valve to bleed off the head pressure.
(5) Apply power to hydraulic power unit and momentarily cut in hydraulic power unit reservoir while observing the fluid level of the aircraft reservoir.
(6) After proper fluid level is obtained in the aircraft reservoir, shut off hydraulic power unit. Tighten nut between reservoir and vent valve.
(7) Bleed hydraulic pressure from lines by pumping brakes.
(8) On aircraft 25-181 and subsequent, remove reservoir filler cap to assure that reservoir is not overfull.
(9) Disconnect hydraulic power unit and replace aircraft hydraulic quick-disconnect dust caps.
(10) Connect batteries and secure tailcone access door.



CHECK FLUID LEVEL ON POSTFLIGHT INSPECTION.
SERVICE WITH MIL-H-5606 HYDRAULIC FLUID.

Hydraulic Reservoir Servicing
Figure 301



NOSE GEAR SHOCK STRUT - SERVICING

1. General

A. The importance of proper nose gear strut servicing cannot be over-emphasized. Over filling with hydraulic fluid or under inflation with air can result in improper straightening of the nose gear after lift off or jamming of the nose wheel in the retracted position.

B. Prior to servicing the nose gear strut the strut must be fully compressed with aircraft full of fuel, without baggage, crew, or passengers.

WARNING: WHEN SERVICING THE STRUT, DO NOT RELEASE AIR BY LOOSENING THE AIR VALVE. LOOSEN THE END NUT ONLY. FAILURE TO COMPLY CAN CAUSE BODILY INJURY.

B. Two methods have been provided for inflating the strut with air.

D. Fill the strut with MIL-H-5606 hydraulic fluid and inflate with either dry air or nitrogen.

2. Service the Nose Gear Strut (See figure 301.)

NOTE: Extreme temperature changes have a significant effect on oil levels and inflation pressures of the landing gear struts. Whenever the airplane has landed at a location at which the ambient temperature varies 50°F (10°C) or more from when last serviced and is to remain on the ground for a significant length of time, the struts must be reserviced. The struts must be serviced at a temperature which is within 50°F (10°C) of the ambient runway temperature expected at takeoff.

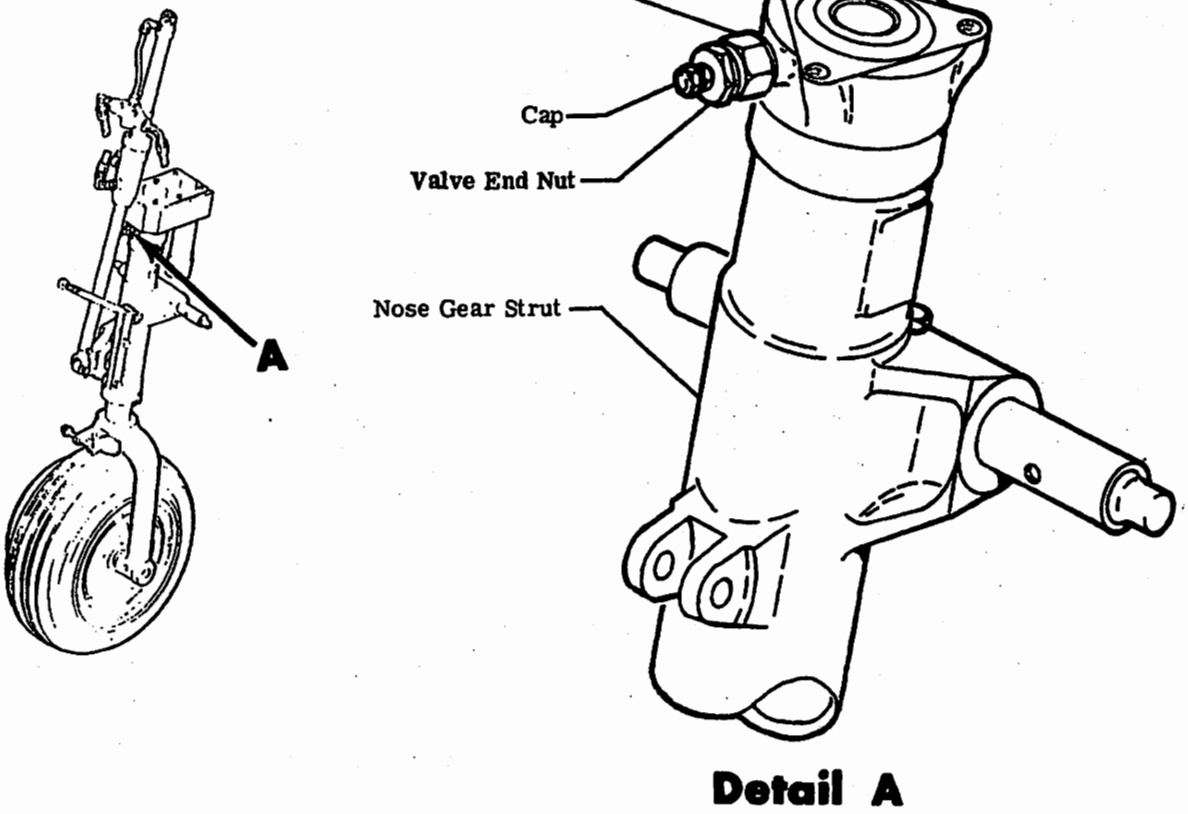
A. Fill Strut with Fluid

WARNING:● DO NOT RELEASE AIR BY LOOSENING OR REMOVING AIR VALVE. LOOSEN END NUT ONLY. FAILURE TO COMPLY CAN CAUSE BODILY INJURY.

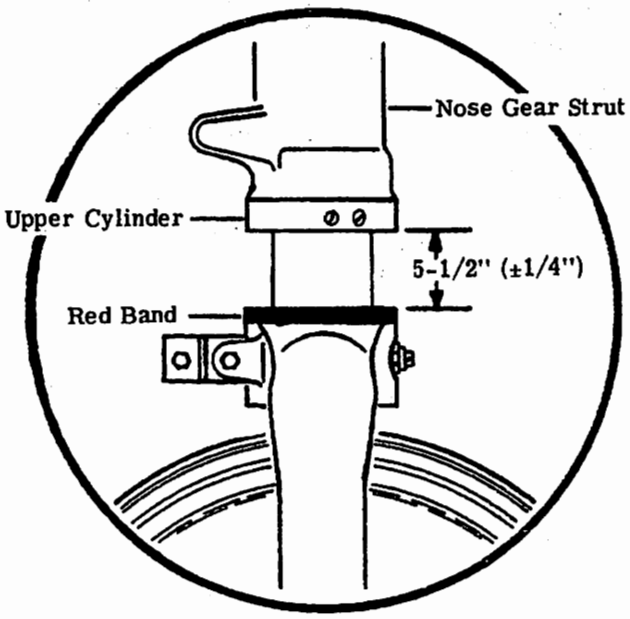
●THE IMPORTANCE OF PROPER NOSE GEAR STRUT SERVICING CANNOT BE OVEREMPHASIZED. OVERFILLING WITH HYDRAULIC FLUID OR UNDER INFLATION CAN RESULT IN IMPROPER STRAIGHTENING AFTER LIFT-OFF OR JAMMING OF THE NOSE WHEEL IN THE RETRACTED POSITION.

(1) Remove cap from air valve and loosen valve end nut 3/4 of a turn to release air pressure.
(2) After all air is released, remove air valve.
(3) With aircraft resting on landing gear, fill strut with clean MIL-H-5606 hydraulic fluid to level of air vlave port.
(4) Install air valve, tighten securely, and safety wire.

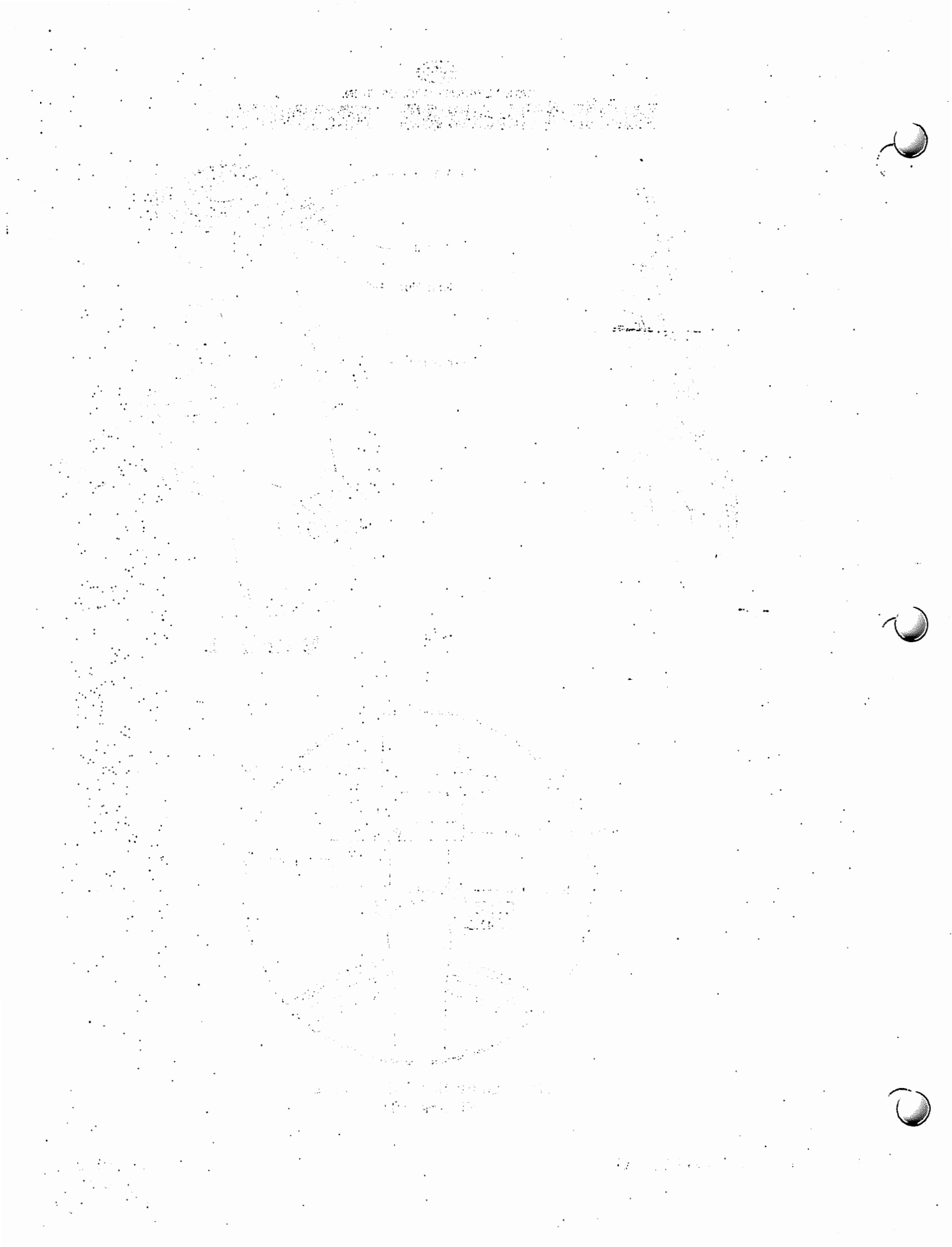
B. Inflate Nose Gear Strut
 (1) Perform normal strut inflation as follows:
 (a) With aircraft resting on nose gear, remove cap from air valve and loosen end nut 3/4 turn. This will enable strut to receive air.
 (b) Inflate strut with dry compressed air or nitrogen until upper edge of red band is 5-1/2 (±1/4) inches from bottom edge of cylinder.
 (c) Tighten valve end nut and replace cap.
 (2) Perform alternate strut inflation as follows:
 (a) Jack nose landing gear clear of ground, remove cap from air valve and loosen end nut 3/4 turn. This will enable strut to receive air.
 (b) Inflate strut with dry compressed air or nitrogen to 58 (±3) psi.
 (c) Tighten valve end nut and replace cap.
 (d) Remove aircraft from jacks.



Detail A



Nose Gear Strut Servicing
Figure 301



MAIN GEAR SHOCK STRUT - SERVICING

1. General
 A. Prior to servicing the main gear shock strut the strut must be fully compressed with aircraft full of fuel, without baggage, crew or passengers.
 B. When servicing the strut, do not release air by loosening or removing the air valve. Loosen end nut only. Failure to comply can cause bodily injury.
 C. Two methods have been provided for inflating the strut with air.
 D. Fill the strut with MIL-H-5606 hydraulic fluid and inflate with dry air or nitrogen.

2. Service the Main Gear Shock Strut (See figure 301.)

 NOTE: Extreme temperature changes have a significant effect on oil levels and inflation pressures of the landing gear struts. Whenever the airplane has landed at a location at which the ambient temperature varies 50°F (10°C) or more from when last serviced and is to remain on the ground for a significant length of time, the struts must be reserviced. The struts must be serviced at a temperature which is within 50°F (10°C) of the ambient runway temperature expected at takeoff.

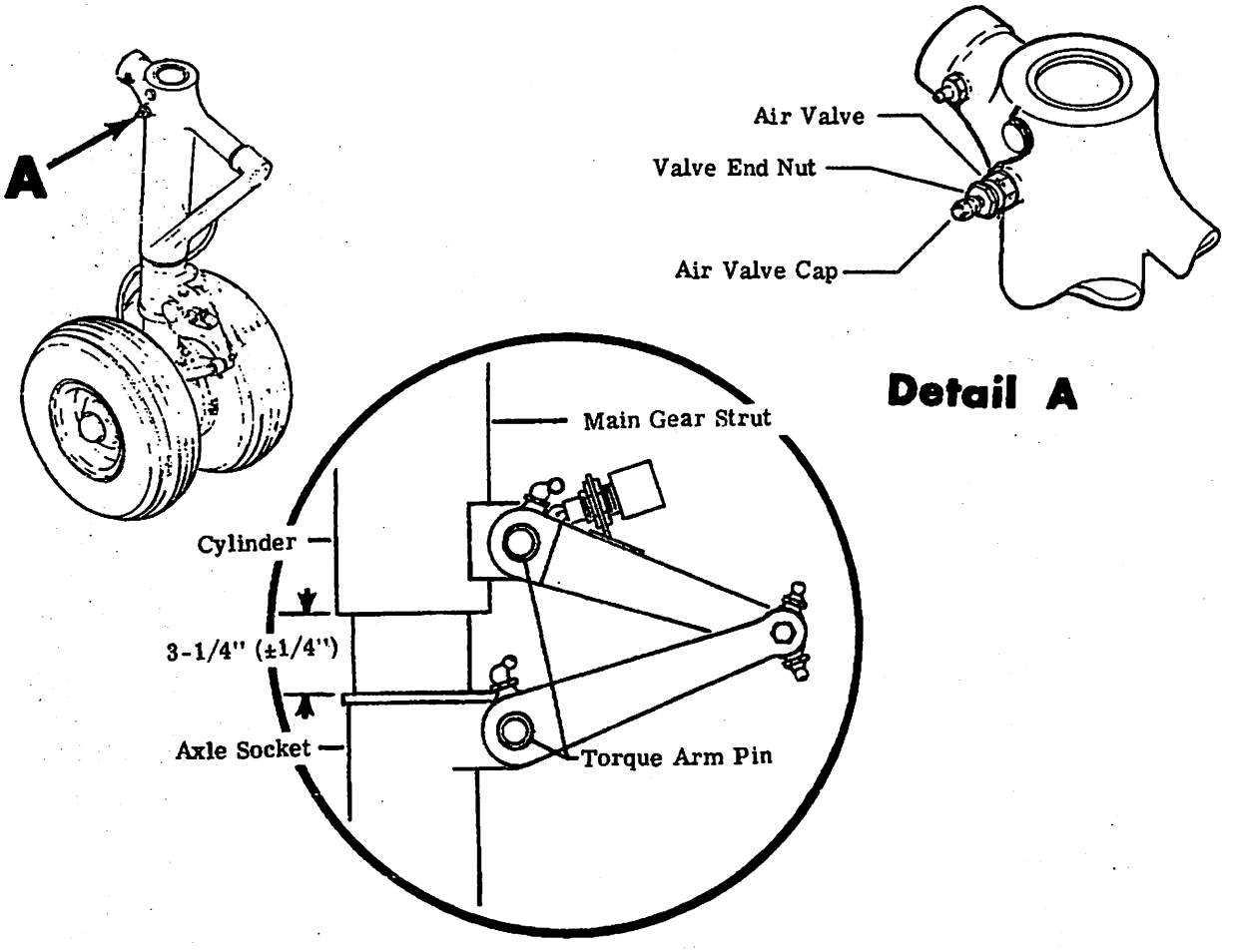
 A. Fill Strut with Fluid

 WARNING: DO NOT RELEASE AIR BY LOOSENING OR REMOVING AIR VALVE. LOOSEN END NUT ONLY. FAILURE TO COMPLY CAN CAUSE BODILY INJURY.

 (1) Remove cap from air valve and loosen valve end nut 3/4 of a turn to release all air from strut.
 (2) After all air is released, remove air valve from strut.
 (3) With aircraft resting on landing gear, fill strut with clean MIL-H-5606 hydraulic fluid to level of air valve port.
 (4) Install air valve, tighten securely, and safety wire.

 B. Inflate Main Gear Strut
 (1) Perform normal strut inflation as follows:
 (a) With aircraft resting on main gear, remove cap from air valve and loosen end nut 3/4 turn. This will enable strut to receive air.
 (b) Inflate strut with dry compressed air or nitrogen until upper edge of axle socket is 3-1/4 (±1/4) inches from lower edge of cylinder.
 (c) Tighten valve end nut and replace cap.

(2) Perform alternate strut inflation as follows:
 (a) Jack main gear clear of ground.
 (b) Remove cap from air valve and loosen end nut 3/4 turn.
 (c) Inflate strut with dry compressed air or nitrogen to 283 (±10) psi.
 (d) Tighten valve end nut and replace cap.
 (e) Remove aircraft from jacks.



Main Gear Strut Servicing
Figure 301

TIRE - SERVICING

1. General
 A. The nose wheel is equipped with a chined tire which is an 18 x 4.4 tubeless, 10-ply rated tire.
 B. The main wheel tires are 18 x 5.5 tubeless, 10-ply rated.
 C. It is recommended that tire pressures be checked during preflight inspection. Tire pressures should be checked by using an accurate dial type gage.
 D. Tire pressures are affected by temperature. Therefore, tire pressure should not be checked unless the tires are at ambient temperature. An ambient temperature change of 5°F (2.75°C) will affect a tire pressure change of 1%. Temperature-pressure changes should be kept in mind particularly when the aircraft is parked in a hot hangar and is rolled onto a cold runway.
 E. Newly mounted tires, for several reasons, will lose air pressure after the initial inflation. It is recommended that a tire not be installed for 12 hours after initial inflation. New tires may lose as much as 10% pressure due to stretch. Used tires may lose as much as 5% pressure due to sidewall diffusion. After a twelve hour period reservice tire to operating pressure.
 F. Tire loading is an important factor to consider when checking tire air pressure. When a tire is loaded, the internal volume decreases which causes tire pressure to increase. The pressure increase is approximately 4% when the tire is loaded. When a tire pressure is specified and is not defined as loaded or unloaded then it shall be considered as unloaded. The nose wheel tire is not considered loaded unless the pilot and copilot are actually sitting in the cockpit.
 G. The dual main gear tire pressures must be maintained as closely as possible to each other. Failure to maintain dual tire pressure as equal as possible may cause an overload of one tire beyond its rated capacity. In a case where one main gear tire has blown out, the adjacent tire should be removed and scrapped due to the possibility of the adjacent tire receiving loads beyond its rated capacity.
 H. Tires are to be serviced using dry compressed air or nitrogen.
 I. When checking pressure or inflating tires in extremely cold climates the aircraft should be brought into the hangar and time allowed for tires and valve stems to warm up. This will keep the valve stem from freezing up and eliminate possible leaks through the valve core. In this condition, tire pressure should be increased to compensate for the temperature-pressure drop which will occur once the aircraft is moved back outside.
 J. After inflating or checking tire pressure the valve core should always be checked for leaks before reinstalling valve cap.

K. Contaminants such as oil, hydraulic fluid, grease, tar and degreasing agents have a deteriorating effect on tires. Contaminants should be wiped from the tire using a gasoline dampened rag and washing with soap and water.

L. The tires can eventually be affected by sunlight and extreme weather conditions. The weather checking which will eventually result does not impair performance unless plies are exposed.

M. If an aircraft should experience a rejected takeoff and above normal braking energies are expended, the main wheel tires should be removed and scrapped. A visual inspection of these tires may not show any apparent damage, however, incipient damage may have occurred which could cause failure.

2. Service Tires

NOTE: Extreme ambient temperature changes have a significant effect on tire pressure. Whenever the aircraft has landed at a location at which the ambient temperature varies 50°F (10°C) or more from when last serviced and is to remain on the ground for a significant length of time, the tires must be reserviced. The tires must be serviced at a temperature which is within 50°F (10°C) of the ambient runway temperature expected at takeoff.

A. Service Nose Gear Tire

(1) Remove valve cap and check tire pressure with a gage capable of 125 psi.

(2) Inflate tire to 105 (±5) psi (104 to 114 psi loaded) with dry air or nitrogen. Assure that valve core is not leaking and replace cap.

NOTE: The nose gear tire is not considered loaded unless the pilot and copilot are actually seated in the cockpit.

B. Service Main Gear Tires

(1) Remove valve cap and check tire pressure with a gage capable of 180 psi.

(2) Inflate tires to 115 (±5) psi (114 to 125 psi loaded) with dry air or nitrogen. Assure that valve core is not leaking and replace cap.

TEMPORARY REVISION NO. 12-8

MANUAL AFFECTED: Gates Learjet Model 25 b/c/d/f Maintenance Manual

FILING INSTRUCTIONS: Insert adjacent to 12-10-05, page 302, dated May 25/84.

REASON: Eddy Current inspection of wheel bead seat radius.

INSTRUCTIONS: Add the following step N under 1. GENERAL.

N. Perform eddy current inspection of main gear wheel bead seat radius, at each tire change, or in the event of a hard or overweight landing, in accordance with procedures outlined in Chapter 32. (Refer to 32-40-00, Inspection/Check.)

REFRIGERATION SYSTEM - SERVICING

1. General

WARNING: DO NOT OPERATE REFRIGERATION SYSTEM WITH CONDENSER AIR OUTLET BLOCKED.

A. Refrigeration system servicing consists of a leakage check, recharging the system and servicing the compressor.

B. The refrigeration system is charged with 2.9 (±0.1) pounds of refrigerant R-12. Overcharging or use of refrigerant other than R-12 can result in damage to refrigeration system or adjacent components.

C. When working with liquid refrigerant, keep liquid refrigerant away from eyes and skin. Liquid refrigerant can cause serious injury because its vaporization causes freezing. Safety goggles and gloves shall be worn when opening refrigeration system connections. If refrigerant should contact eyes or skin, do not rub. Splash affected area with large quantities of cold water and obtain medical treatment as soon as possible.

D. The compressor oil shall be checked prior to charging the system and after the vapor system has been dumped. On aircraft prior to 25-343 (equipped with a York compressor), the compressor oil reservoir is factory-filled with 10 fluid ounces (295.7 ml) of refrigeration oil. On 25-343 and Subsequent (equipped with Sankyo compressor), the compressor oil reservoir is factory-filled with 6 fluid ounces (177.4 ml) of refrigeration oil. Only Texaco Capella D grade refrigerant oil or the equivalent shall be used when adding oil to the compressor.

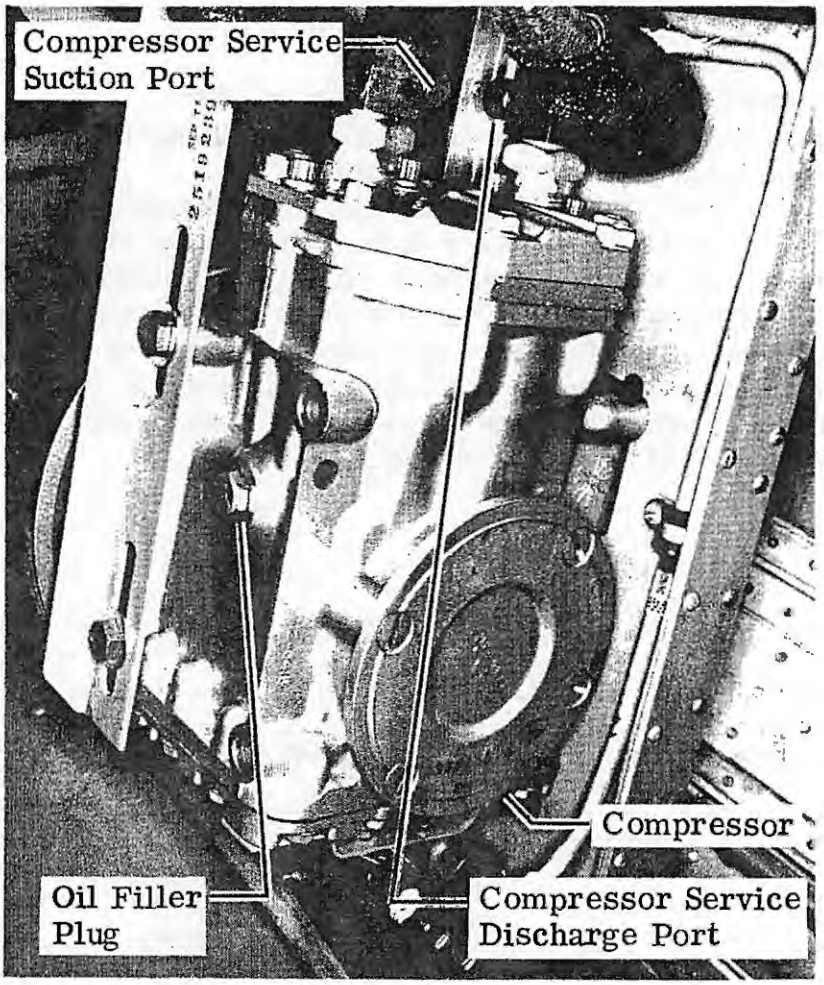
2. Tools and Equipment

NAME	NUMBER	MANUFACTURER
Three yellow jacket hoses with valve depressors.		Commercially Available
Manifold and gages	CM 4D-3	Madden
Refrigerant	R-12	Commercially Available
Halogen Leak Detector	H-10	General Electric
Charging Unit	12560	Robinair
*Charging Unit (Includes vacuum pump, manifold, and gages)	44409	Robinair
High Vacuum Pump (capable of pulling 28" Hg.)		Commercially Available

*Used with Sankyo compressor.

3. Maintenance Precautions
 A. The following procedures must be observed when handling components to insure high standards of cleanliness.
 (1) All components are purged and sealed before shipment. Shipping caps should not be removed until just prior to making connections.
 (2) All components should be at room temperature before uncapping to prevent condensation of moisture.
 (3) A complete or partially built-up system should not remain uncapped longer than necessary to make a connection.
 (4) Take precautions to prevent damage to fittings or connections.
 (5) Use a cloth dipped in alcohol to remove grease or dirt from the outside of fittings.
 (6) Components of questionable condition should not be used.
 (7) If dirt, grease, or moisture gets inside the lines, the lines should be replaced or flushed.
 (8) If internal cleaning of components is required, only dry nitrogen or Refrigerant R-12 should be used.
 (9) Prior to assembly, use a small amount of fresh refrigerant oil on all tubes, hose joints, and O-rings.
 (10) When tightening joints, use a second wrench to hold the stationary part of the connection to prevent twisting and hose kinking.

4. Servicing
 A. Perform Refrigeration System Leakage Check
 (1) The system leakage check is to be performed in an area with an ambient temperature of 65°F or above.
 (2) Remove caps from compressor suction and discharge service ports.
 (3) Close vacuum tight valves and high and low pressure gage valves on service equipment. Connect service equipment as shown in figure 301.
 (4) Check for system pressure of approximately 65 psig or above. The low pressure gage may be used to check system pressure. If system pressure is below 65 psig, a small amount of refrigerant R-12 may be added to obtain the required pressure.
 (5) On systems that have not been operated for 2 weeks or longer, operate the system for a minimum of 15 minutes. This will lubricate the compressor shaft seal and insure a more accurate leakage check of the shaft seal.
 (6) Using a General Electric H-10 leak detector or equivalent, check all connections and fabricated units for leakage. Leakage at connections and fabricated units is not acceptable. Slight leakage is acceptable at the compressor shaft seal.
 B. Discharge Refrigeration System
 (1) Disconnect hose from servicing equipment tee. This will allow an opening for discharging the system overboard.

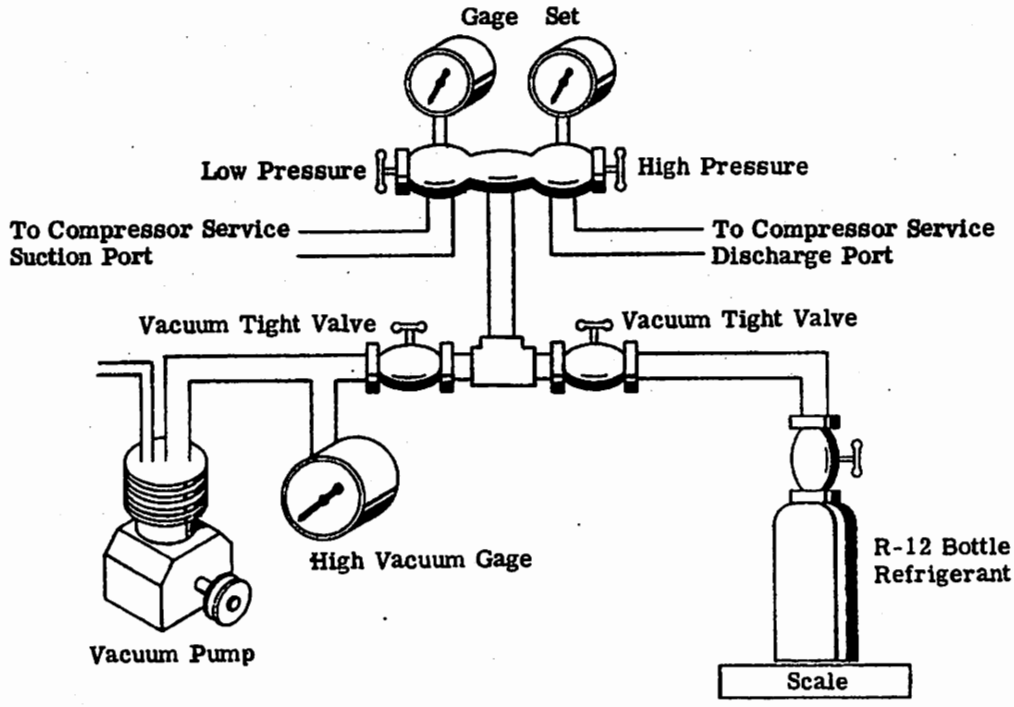


LOOKING AFT FROM THE TAILCONE ACCESS

Refrigeration System Servicing
Figure 301 (Sheet 1 of 2)

(2) Crack the high pressure valve allowing refrigerant to slowly escape. A slight amount of oil will escape with the discharging refrigerant. An excessive amount of oil indicates the refrigerant is discharging too rapidly.
(3) When all refrigerant has escaped, close the high pressure valve and connect hose to service equipment tee.
(4) Check compressor oil level.

C. Check Compressor Oil Charge (See figure 302)
(1) Fabricate a compressor oil dipstick as shown in figure 302.
(2) Remove compressor oil filler plug.
(3) The oil level should be checked with the crankshaft keyway up relative to the compressor head. This places the crankshaft throws into the most favorable position for passage of the dipstick.
(4) The compressor oil charge should be maintained at approximately 10 ounces. The following oil charges versus dipstick depths are applicable: 8 ounces - 0.90 inch on dipstick; 9 ounces - 1.08 inches on dipstick; 10 ounces - 1.19 inches on dipstick; and 11 ounces - 1.32 inches on dipstick.



Refrigeration System Servicing
Figure 301 (Sheet 2 of 2)

(5) Slip the sealing O-ring over the oil filler plug threads, making sure the O-ring is not twisted.

(6) Insert the oil plug in the filler opening and tighten the plug. If the plug leaks, do not attempt to stop the leak by overtightening the plug. A leak may be caused by dirt under the O-ring or on the seat, a fractured O-ring, or a damaged seat on the oil filler plug or in the oil filler opening. To stop the leaks, correct the mechanical damage and install a new O-ring.

D. Check Compressor Oil Charge (See figure 303.) (Aircraft 25-343 and Subsequent.)

(1) Operate refrigeration system for 10 minutes.

(2) Remove refrigerant from system at a slow rate to prevent oil loss.

(3) Fabricate a compressor oil dipstick as shown in figure 303.

(4) Remove compressor oil filler plug and, while looking through hole, rotate clutch front plate to position internal parts as shown in figure 303.

(5) Insert dipstick into compressor as shown in figure 303. Oil level shall be between marks indicated for compressor angle.

(6) Slip sealing O-ring over oil filler plug threads, making sure O-ring is not twisted.

(7) Insert oil plug in filler opening and torque to 6 - 9 foot-pounds.

NOTE: Do not overtighten the filler plug to stop a leak. Remove plug and install a new O-ring.

E. Purge and Evacuate Refrigeration System.

WARNING: KEEP LIQUID REFRIGERANT AWAY FROM EYES AND SKIN. LIQUID REFRIGERANT CAN CAUSE SERIOUS INJURY BECAUSE ITS VAPORIZATION CAUSES FREEZING. SAFETY GOGGLES SHALL BE WORN WHEN OPENING REFRIGERATION SYSTEM CONNECTIONS. IF REFRIGERANT SHOULD CONTACT THE EYES OR SKIN, DO NOT RUB. SPLASH AFFECTED AREA WITH LARGE QUANTITIES OF COLD WATER AND OBTAIN MEDICAL TREATMENT AS SOON AS POSSIBLE.

(1) Start vacuum pump and slowly open high and low pressure valves. Operate vacuum pump until 26 to 28 inches of Hg is obtained. Time to evacuate should be less than 15 minutes.
(2) When vacuum gage indicates 26 to 28 inches of Hg, close high and low pressure valves and shut off vacuum pump.
(3) Open refrigerant bottle valve and low pressure valves allowing 2 ounces of refrigerant R-12 to flow into system. Close low pressure and refrigerant bottle valves when system pressure stabilizes.
(4) Repeat steps 1 through 3 twice. The system is now completely purged and ready for charging.

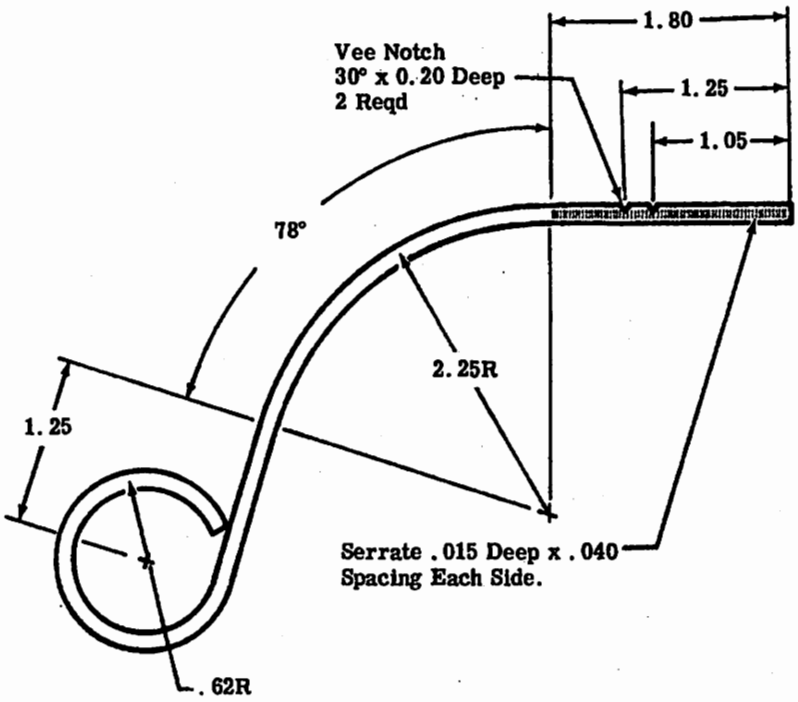
F. Charge Refrigeration System

WARNING: KEEP LIQUID REFRIGERANT AWAY FROM EYES AND SKIN. LIQUID REFRIGERANT CAN CAUSE SERIOUS INJURY BECAUSE ITS VAPORIZATION CAUSES FREEZING. SAFETY GOGGLES SHALL BE WORN WHEN OPENING REFRIGERATION SYSTEM CONNECTIONS. IF REFRIGERANT SHOULD CONTACT THE EYES OR SKIN, DO NOT RUB. SPLASH AFFECTED AREA WITH LARGE QUANTITIES OF COLD WATER AND OBTAIN MEDICAL TREATMENT AS SOON AS POSSIBLE.

(1) Place the refrigerant bottle on a 0- to 100-pound scale and record weight.
(2) Connect external power to aircraft and set Battery Switch(es) to ON.
(3) Set Cabin Climate Control Switch to COOL.

CAUTION: THE REFRIGERATION SYSTEM IS CHARGED WITH 2.9 (±0.1) POUNDS OF REFRIGERANT R-12. DO NOT OVERCHARGE.

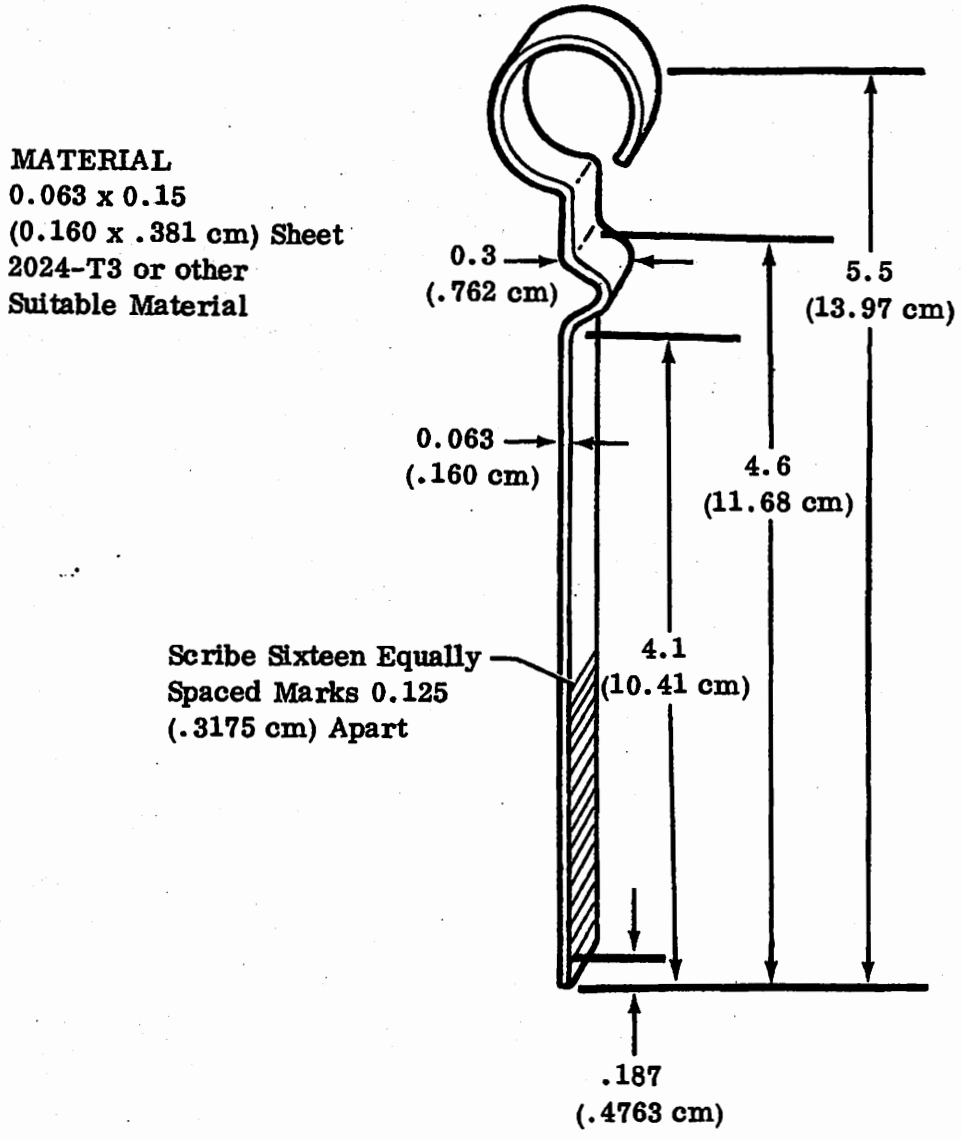
(4) Open refrigerant bottle valve and low pressure valve. Close valve when scale reading has reduced 2.9 (±0.1) or 3 pounds. Time to charge is approximately 10 minutes.
(5) Operate system for a minimum of 30 minutes with a minimum of six starts and stops.
(6) Check the refrigerant sight glass on the dehydrator to assure the system has an adequate refrigerant charge. Except during start-up of a fully charged system, no bubbles should appear in the sight glass.
(7) Check system plumbing during unit operation for vibration and security of attaching clamps.



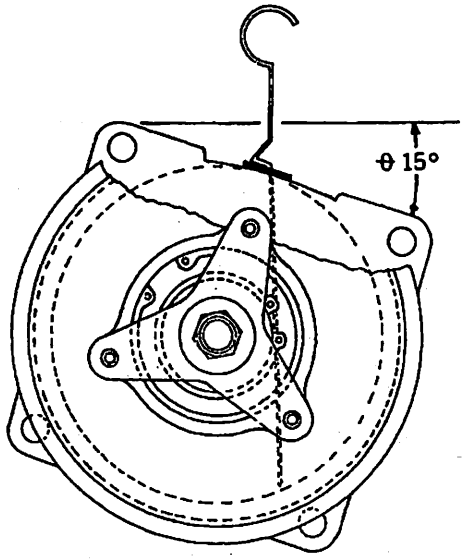
Effective for Aircraft prior to 25-343.

Material - 5/32 Dia. Corrosion Resistant Steel 18-8 or Equivalent

Freon Compressor Oil Dipstick
Figure 302 (Sheet 1 of 2)

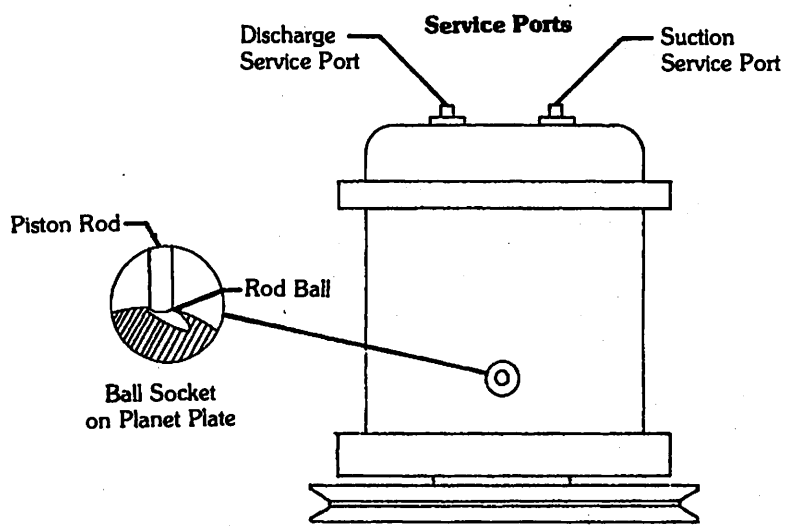


Freon Compressor Oil Dipstick
Figure 302 (Sheet 2 of 2)



MOUNTING ANGLE θ DEGREES	ACCEPTABLE OIL LEVEL IN INCREMENTS (Corresponds to 6 [±0.5] oz. [177 (±14.75) ml])
0°	4-6
10°	6-8
20°	7-9
30°	8-10
40°	9-11
50°	9-11
60°	9-12

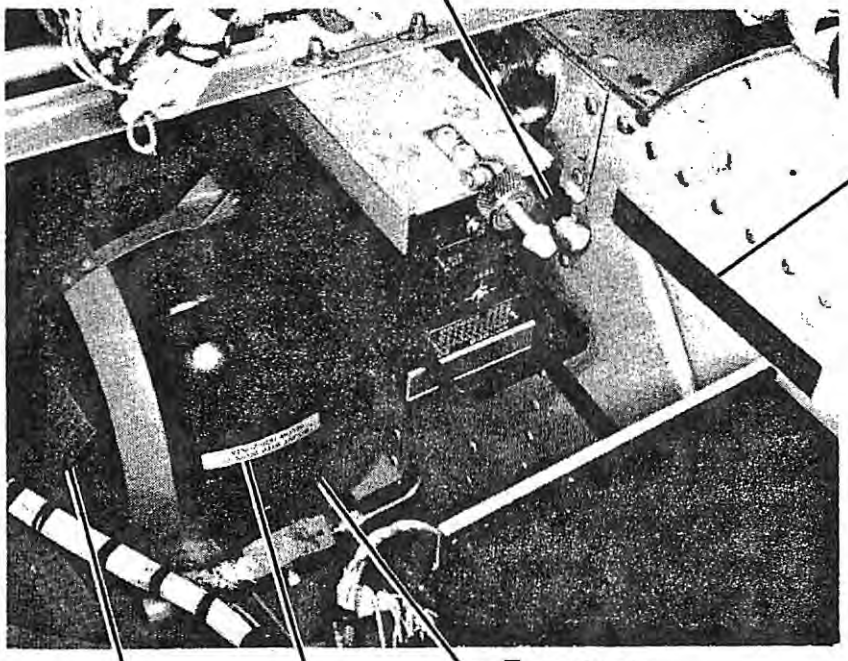
Dipstick Installation



Positioning Internal Compressor Parts
Figure 303

EMERGENCY AIR BOTTLE - SERVICING

1. General
 - A. The emergency air bottle furnishes emergency pressure to extend the landing gear and for emergency braking in case of hydraulic or electrical failure.
 - B. The bottle is located in the nose section and is accessible through the nose compartment access doors.
 - C. The bottle is to be serviced with dry air or nitrogen to between 1800 and 3000 psi. Bottle pressure is indicated by a pressure gage on the instrument panel.
 - D. Assure that dry air or nitrogen is used to service the emergency air bottle. Moisture in the system can cause failure during exposure to extremely low temperatures.
 - E. In accordance with current inspection intervals, Chapter 5, the bottle must be inspected and tested to ensure serviceability.
 - F. Assure that bottle is discharged prior to removal of the bottle or its components.
 - G. Visual inspection of the emergency air bottle requires removal of the main fitting for interior inspection. When reinstalling the main fitting use a new O-ring (Kidde P/N 213859 or Tavco P/N MS28778-12). Lubricate O-ring with Dow Corning DC 55. Torque main fitting to 50 ft. lbs.
 - H. The air bottle fill valve is located on the RH side of the nose wheel box inside the nose compartment.
2. Servicing
 - A. Charge Emergency Air Bottle (See figure 301)
 - (1) Remove right nose compartment access door.
 - (2) Remove cap from emergency air bottle air valve.
 - (3) Attach high pressure adapter to air valve and loosen valve end nut.
 - (4) Monitor emergency air gage on instrument panel and pressurize the emergency air bottle to 1800 to 3000 psi.
 - (5) Tighten air valve end nut and remove high pressure adapter.
 - (6) Install air valve cap and replace nose compartment access door.
3. Visual Inspection
 - A. Inspect Emergency Air Bottle Interior Surface
 - (1) Inspect interior surface paying close attention to surface condition and in particular, any evidence of corrosion.
 - (2) Any visible cracking or flaking of the coating or evidence of corrosion is cause for removing container from service.
 - (3) Isolated cracks or corrosion appearing as a fine line may be an indication of stress weakening of the base metal. Any containers showing evidence of stress weakening should be returned to the manufacturer for reinspection.
 - (4) Any corrosion causing a decrease in wall thickness of .005 inches from original wall thickness is considered severe corrosion and cause for removal of container from service.



Looking Aft into R. H. Nose Compartment

Emergency Air Bottle Servicing
Figure 301

Gates Learjet Corporation

maintenance manual

Temporary Revision No. 12-7

MANUAL AFFECTED: 25BCDF MAINTENANCE MANUAL

FILING INSTRUCTIONS: Insert adjacent to 12-10-07, page 303 dated October 16/81 and retain until further notice.

REASON: To delete HYDROSTATIC TEST procedure for emergency air bottle.

INSTRUCTIONS: Delete existing step 4.A. under HYDROSTATIC TEST and insert the following step 4.A.

4.

A. Accomplish hydrostatic test of emergency air bottle in accordance with manufacturers recommendations.

WARNING: Hydrostatic testing shall be accomplished only by a facility equipped to observe all safety precautions required during high pressure testing.

NOTE: An alternate to the above is to exchange the bottle for a tested unit.

B. Inspect Emergency Air Bottle Exterior Service

NOTE: Record dates from foil inspection label on air bottle; retain this information.

(1) Remove paint for visual inspection of air bottle.
(2) Inspect exterior for bulging, dents, corrosion, mechanical defects and general condition.
(3) Any bulging of the container is cause for rejection.
(4) Severe dents are cause for rejection.
(5) Any corrosion causing a decrease in wall thickness of .005 inches from original wall thickness is considered severe corrosion and cause for removal of container from service.
(6) Mechanical defects include scratches, cuts, digs and gouges and are cause for rejection if they are not superficial in nature. Containers must be rejected if the wall thickness has been reduced by mechanical defects by more than 5% of wall thickness.

4. Hydrostatic Test

A. Hydrostatic testing is accomplished by subjecting the emergency air bottle to five-thirds times the service pressure. The test shall be performed in a water jacket and the total and permanent volumetric expansions recorded. The permanent expansion must not exceed 10% of the total expansion.

B. Perform a radiographic inspection of the container following hydrostatic test. If cracks are found the container shall be removed from service and destroyed.

C. Magnetic particle inspection may also be performed if desired.

WARNING: DO NOT STEEL STAMP THE PRESSURE VESSEL ITSELF. ONLY THE FOIL LABEL SHOULD BE STAMPED. STAMP DATES ON NEW FOIL LABEL BEFORE PLACING IT ON AIR BOTTLE TO PREVENT ANY DAMAGE TO BOTTLE EXTERIOR.

D. After emergency air bottle has passed inspection and testing, proceed as follows:

(1) Paint air bottle:
(a) (Walter Kidde) One coat of primer (TT-P-664) and one coat of black enamel (MIL-E-5557 Type II).
(b) (Tavco) One coat of primer (TT-P-664) and two coats dull black lacquer (TT-L-32 Type I).

WARNING: DO NOT STEEL STAMP THE PRESSURE VESSEL ITSELF. ONLY THE FOIL INSPECTION LABEL SHOULD BE STAMPED. STAMP DATES ON NEW FOIL LABEL BEFORE PLACING IT ON AIR BOTTLE TO PREVENT ANY DAMAGE TO AIR BOTTLE EXTERIOR.

(2) Stamp foil inspection label (Walter Kidde P/N 213880), (Tavco P/N 60015448) with dates previously recorded and, month and year of this inspection and test.

(3) Install foil inspection label by peeling off back of label. Place label onto air bottle. Apply pressure evenly to adhere lable to air bottle. See figure 301.

(4) Install foil mounting instruction label onto bottle by peeling off back of label. Place label onto air bottle. Apply pressure evenly to adhere label to air bottle. (See figure 301.)

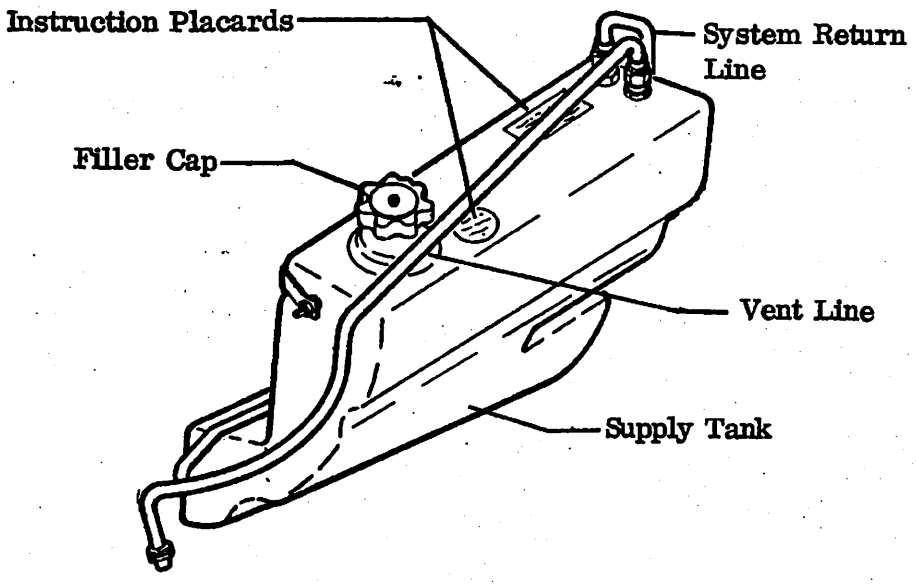
ALCOHOL ANTI-ICE SYSTEM - SERVICING

1. General
 A. Alcohol for the windshield and radome anti-icing is stored in a 2.2 gallon (1.75 on Aircraft 25-227 and Subsequent) supply tank located on the LH side of the nose compartment.
 B. The tank is to be refilled with methyl alcohol, O-M-232, Grade A.

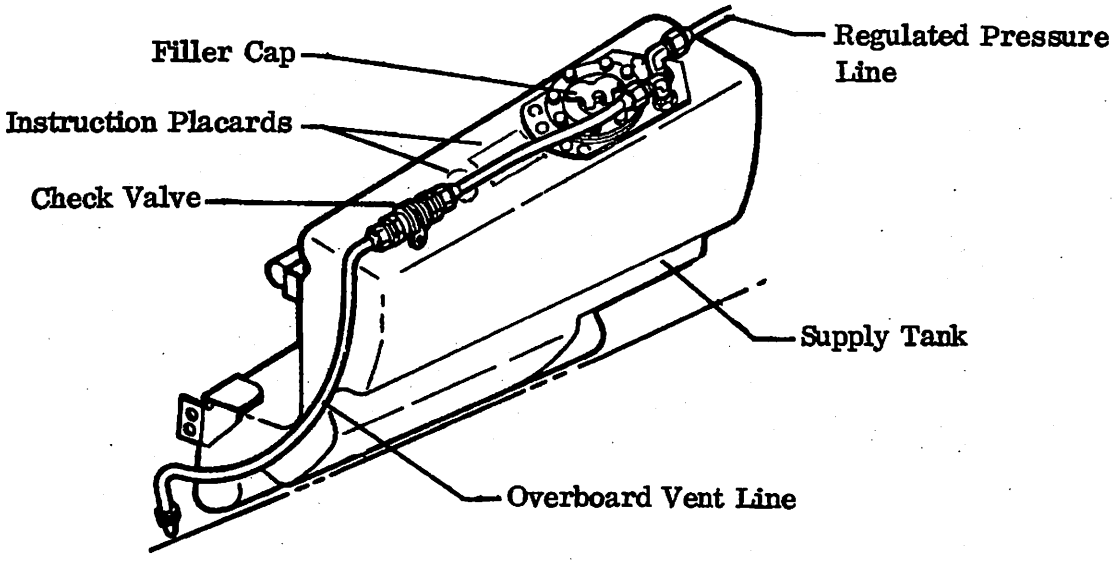
2. Servicing

 NOTE: On Aircraft 25-227 and Subsequent, remove filler cap per instruction placard.

 A. Refill Alcohol Tank (See figure 301)
 (1) Remove left nose compartment access door.
 (2) Remove filler cap and fill tank with methyl alcohol, O-M-232, Grade A.
 (3) Replace filler cap and nose compartment access door.

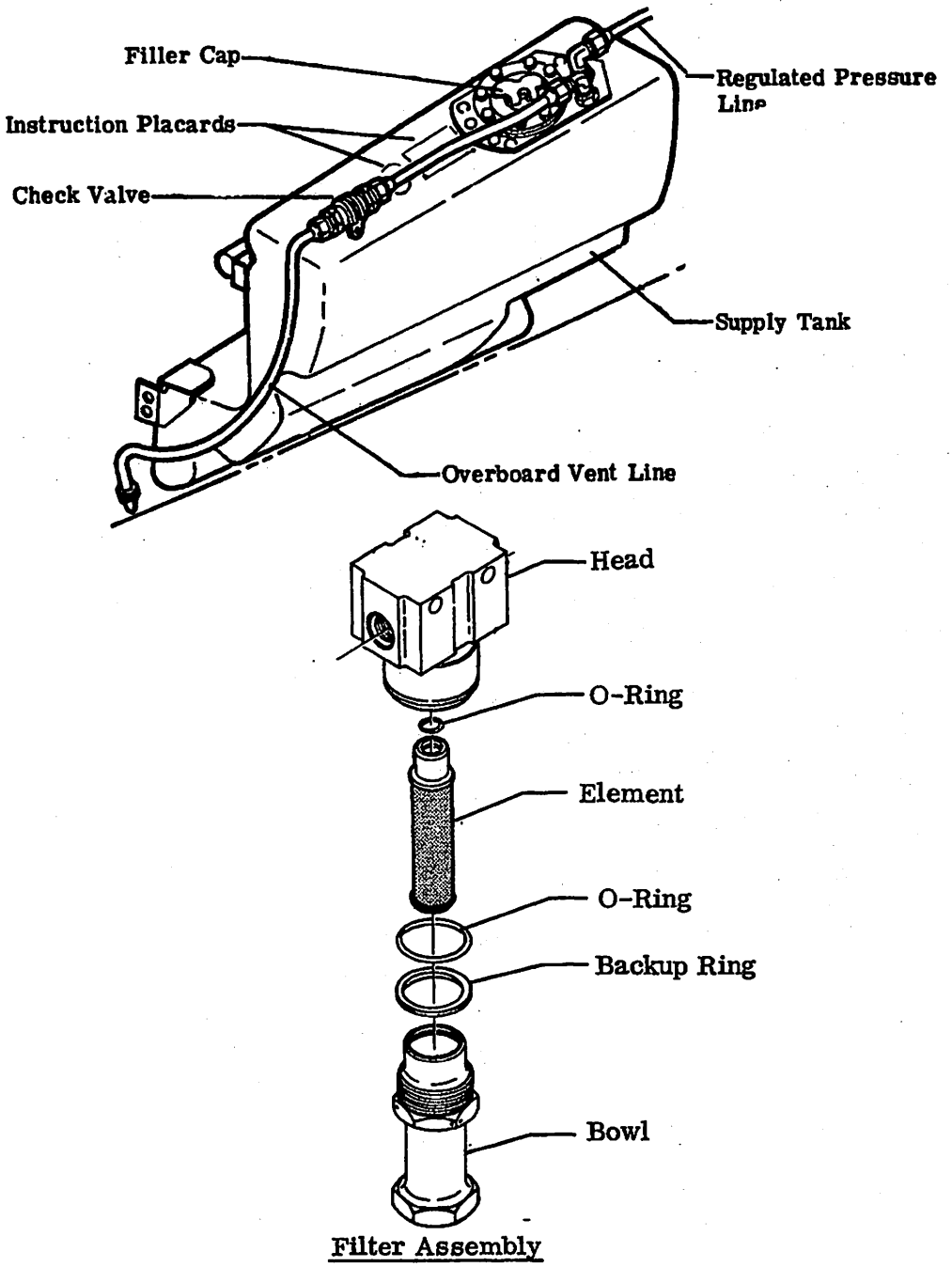


AIRCRAFT 25-061, 25-070 THRU 25-226



AIRCRAFT 25-227 AND SUBSEQUENT

Alcohol System Servicing
Figure 301



Filter Assembly

Alcohol System Servicing
Figure 301 (Sheet 2 of 2)

OXYGEN SYSTEM - SERVICING

1. General
 A. The oxygen bottle, shutoff valve and regulator assembly, and charging (fill) valve are accessible through an access door located on the right side of the dorsal fin.
 B. Standard maintenance practices utilized for any aviation oxygen system should be followed. Precautions against oil grease, and organic matter should be observed.
 C. If the oxygen bottle should be thermally discharged, the burst disc and its washer and the green discharge indicator must be replaced prior to recharging the bottle (Refer to 35-20-04). The burst disc is located in the discharge port of the bottle shutoff valve and regulator assembly. The green discharge indicator is located just below the oxygen bottle access door on the dorsal.
 D. The regulator normally does not need to be closed, however, whenever servicing or performing maintenance on the oxygen system assure that regulator is open prior to returning aircraft to service.
 E. Use only dry breathing oxygen, Federal Specification MIL-O-2710, Type 1, from a green colored cylinder.

2. Servicing
 A. Charge the Oxygen Bottle (See figure 301)
 (1) Open oxygen service door located on right side of dorsal.
 (2) Remove fill valve cap and attach oxygen supply to fill valve.

 NOTE: Slight leakage may be detected when the fill valve cap is removed.

 WARNING: RAPID CHARGING OF THE OXYGEN SYSTEM WILL CREATE A DANGEROUS OVERHEAT CONDITION IN THE BOTTLE.

 (3) Open supply tank valve and slowly charge the oxygen system to the pressure specified in figure 301.
 (4) Close supply line valve and disconnect supply line.
 (5) Install fill valve cap on fill valve. Tighten cap using care when torquing to prevent stripping of threads.
 (6) Check fill valve cap for leaks.
 (7) Assure that shutoff valve and regulator assembly is turned on.
 (8) Close oxygen service door.

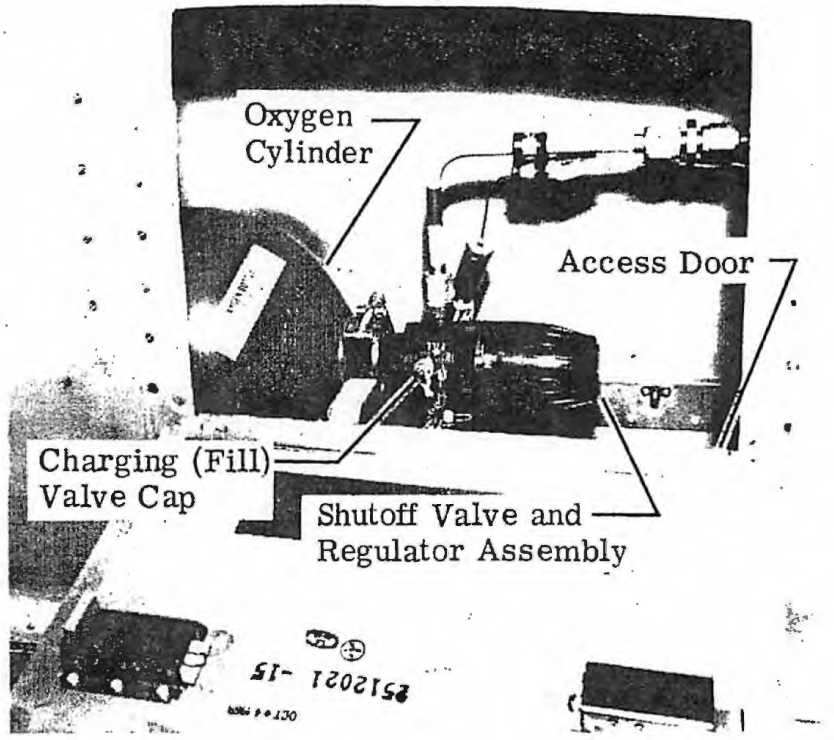
B. Deplete Oxygen Bottle Pressure

(1) Gain access to oxygen bottle.

WARNING: USE A CLEAN HOSE THAT IS COMPATIBLE WITH OXYGEN.

(2) Either remove bottle from aircraft (refer to Chapter 35) or connect a clean hose to oxygen bottle regulator outlet port.

(3) Slowly release oxygen pressure, directing it into an open area away from aircraft.



AMBIENT TEMP °F	CHARGING PRESSURE PSIG	AMBIENT TEMP °F	CHARGING PRESSURE PSIG
0	1600	*70	*1925
10	1650	80	1950
20	1675	90	2000
30	1725	100	2050
40	1775	110	2100
50	1825	120	2150
60	1875	130	2200

NOTE: This figure provides approximate pressure to which aircraft bottle may be charged to have 1800 psig after cooling.

* EXAMPLE: Ambient temperature is 70° F. Charge bottle to 1925 psig.

Oxygen System Servicing
Figure 301

FUEL - SERVICING

1. General

A. Fuel servicing includes those procedures necessary for fueling, adding anti-ice additives, and defueling,

B. Fueling is accomplished through a filler in the top of each tip tank. The fuel gravity flows from the tip tanks to the wing tanks. Both electrically operated wing standby pumps fill the fuselage tank when the Fuselage Tank Switch is set to FILL.

C. The wide range of temperatures to which jet fuels are exposed in flight results in substantial changes in the water solubility of the fuel and consequently in the amount of free water which must be coped with by the blending with anti-ice additives. The additive functions as a freeze-point depressant and as a biocide. Its partitioning characteristics make it especially effective in nullifying the icing effects of small quantities of water in jet fuels. The second important characteristic of this jet fuel additive is its action as a biocidal agent which prevents fungal and bacterial growth in fuel systems and fuel tanks. Thus, when used in proper amounts, the additive provides both anti-icing and microbial growth protection in a single additive.

D. Prolonged storage of the aircraft will result in a water buildup in the fuel which "leaches out" the additive. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps. The concentration can be checked using a Differential Refractometer, manufactured by the Seiscor Corporation, Tulsa, Oklahoma. It is imperative that the Technical Manual for the Differential Refractometer be followed explicitly when checking the additive concentration. The minimum additive concentration shall be 0.035% by volume and maximum concentration shall be 0.15% by volume.

E. Defueling is accomplished by using defueling valves located at the right and left wing tank sump drains and may be defueled by the gravity method or using a suction pump on a fuel truck.

2. Safety Precautions

WARNING:
- ALL MAINTENANCE AND SERVICE PERSONNEL: YOUR ATTENTION IS DIRECTED TO FAA ORDER 8110.34, DATED MARCH 31/80, "PROCEDURES FOR THE USE OF ALTERNATE FUELS FOR TURBINE-POWERED AIRCRAFT."
- SWITCH FUELING IS THE PRACTICE OF MIXING FUELS WITH A FLASH POINT OF LESS THAN 100°F (38°C) WITH FUELS HAVING A FLASH POINT OF MORE THAN 100°F OR VICE VERSA. MIXING KEROSENE BASE, JP5, JET-A, OR JET-A1 FUELS WITH WIDE-CUT PETROLEUM DISTILLATES, JP4 AND JET-B IS CONSIDERED SWITCH FUELING. SWITCH FUELING CHANGES THE FUEL/AIR MIXTURE FLAMMABILITY CHARACTERISTICS. WHEN SWITCH FUELING MUST BE ACCOMPLISHED, FUELING RATES MUST BE REDUCED TO ONE-HALF THE NORMAL RATES.

A. Aircraft should be defueled and fueled only in areas which permit free movement of fire equipment.

B. Assure that fuel truck is grounded to an approved grounding source. Attach a ground from fuel truck to aircraft nose gear uplatch spacer and ground fuel nozzle to tip tank grounding jack.

C. Do not attempt to completely fill one tank before adding fuel to the opposite tank as excessive lateral unbalance may occur. When fueling, fill both tanks simultaneously or alternately add 125 gallons to each tip tank until desired amount is obtained. Tanks should also be defueled as evenly as possible to prevent an unbalance condition.

D. When defueling, the container for catching fuel must be grounded to the nose gear uplatch spacer and the aircraft must be grounded to an approved grounding source.

E. Military JP4 type fuel refined in the United States has anti-icing additive conforming to MIL-I-27686 blended at the refinery and no additional treatment is necessary. However, some nonmilitary JP4 type fuel does not have anti-icing additive meeting the requirements of MIL-I-27686 blended at the refinery. Any approved fuels not containing the additive must have it blended during refueling. Prior to refueling, check with the fuel supplier to determine if the fuel contains anti-icing additive.

F. Assure that additive is directed into the flowing fuel stream and that the additive flow is started after fuel flow starts and is stopped **before fuel stops.** Due to the chemical composition of fuel additives, improper blending can cause deterioration of fuel tank interior finishes and promote corrosion. Additive flow must be maintained throughout the refueling process. Do not use less than one container (20 fl. oz.) of additive per 260 gallons of fuel or more than one container of additive per 104 gallons of fuel. Blender will discharge completely in approximately 4 minutes. Monitor blender tube to assure additive flow is maintained. Do not allow concentrated additive to contact coated interior of fuel tank or aircraft painted surfaces.

G. "Hi-Flo Prist" may be harmful if inhaled or swallowed. Use adequate ventilation. Avoid contact with skin and eyes. If sprayed into eyes, flush with large amounts of water and contact a physician immediately.

3. Refueling

CAUTION: MILITARY JP4 TYPE FUEL REFINED IN THE UNITED STATES HAS ANTI-ICING ADDITIVE CONFORMING TO MIL-I-27686 BLENDED AT THE REFINERY AND NO ADDITIONAL TREATMENT IS NECESSARY. HOWEVER, SOME NONMILITARY JP4 TYPE FUEL DOES NOT HAVE ANTI-ICING ADDITIVE MEETING THE REQUIREMENTS OF MIL-I-27686 BLENDED AT THE REFINERY. ANY APPROVED FUELS NOT CONTAINING THE ADDITIVE MUST HAVE IT BLENDED DURING REFUELING. PRIOR TO REFUELING, CHECK WITH THE FUEL SUPPLIER TO DETERMINE IF THE FUEL CONTAINS ANTI-ICING ADDITIVE.

A. Blend Anti-Ice Additive (See figure 301.)

WARNING: "HI-FLO PRIST" MAY BE HARMFUL IF INHALED OR SWALLOWED. USE ADEQUATE VENTILATION. AVOID CONTACT WITH SKIN AND EYES. IF SPRAYED INTO EYES, FLUSH WITH LARGE AMOUNTS OF WATER AND CONTACT A PHYSICIAN IMMEDIATELY.

(1) Attach blender tube to fuel nozzle as shown in figure 301.

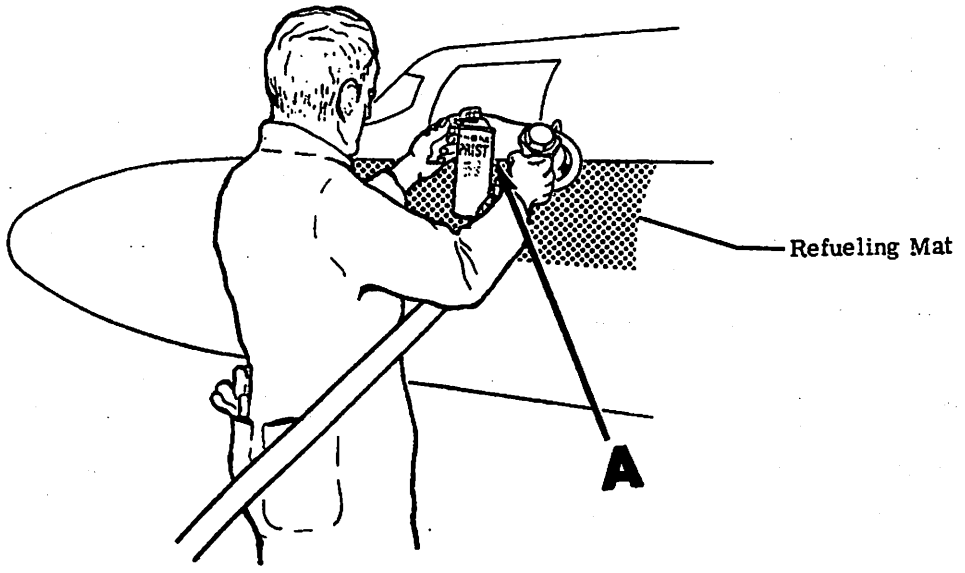
CAUTION: DUE TO THE CHEMICAL COMPOSITION OF FUEL ADDITIVES, IMPROPER BLENDING CAN CAUSE DETERIORATION OF FUEL TANK INTERIOR FINISHES AND PROMOTE CORROSION. ADDITIVE FLOW MUST BE MAINTAINED THROUGHOUT THE REFUELING PROCESS. DO NOT USE LESS THAN ONE CONTAINER (20 FL. OZ.) OF ADDITIVE PER 260 GALLONS OF FUEL OR MORE THAN ONE CONTAINER OF ADDITIVE PER 104 GALLONS OF FUEL. BLENDER WILL DISCHARGE COMPLETELY IN APPROXIMATELY 4 MINUTES. MONITOR BLENDER TUBE TO ASSURE ADDITIVE FLOW IS MAINTAINED. DO NOT ALLOW CONCENTRATED ADDITIVE TO CONTACT COATED INTERIOR OF FUEL TANK OR AIRCRAFT PAINTED SURFACES.

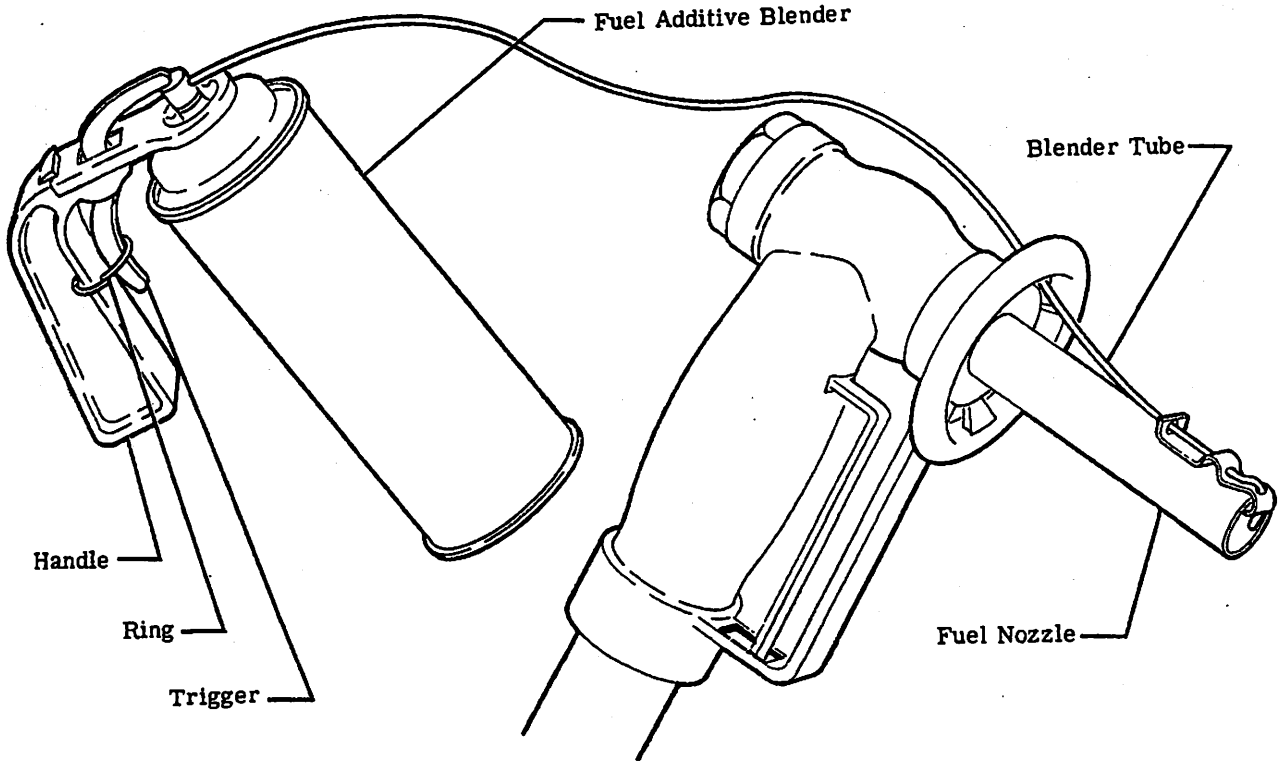
(2) Assure that additive blender tube is directed into the fuel flow stream. Start fuel flow then start additive flow. Stop additive flow prior to stopping fuel flow.

NOTE:
- Fueling rate shall be no less than 30 gpm and not more than 60 gpm (rate may be less than 30 gpm during "topping off").
- Concentration of additive in the fueled aircraft will be approximately 0.09% by volume when above procedure is used. Immediately after servicing, the concentration shall be a maximum of 0.15% and a minimum of 0.06%.

B. Biodical Additive

(1) Biobor JF is an effective biocide approved for use in the Model 25B/C/D/F aircraft when this biocide has been premixed in the proper proportions in the fuel storage tanks. Over-the-wing mixing of Biobor is not approved. This additive is strictly for microbial protection and





Detail A

Blending Anti-Ice Additives
Figure 301

is not an anti-icing agent. Biobor JF can be used in concentrations of up to but not to exceed 270 ppm. Biobor JF can be used concurrently with the anti-icing additives. For additional information, refer to Biobor Service Bulletin 978.

CAUTION: DRAIN ALL SUMPS PRIOR TO REFUELING. EXCESSIVE WATER CONCENTRATIONS IN CONTACT WITH EXCESSIVE BIOBOR JF CONCENTRATIONS CAN RESULT IN FORMATION OF SOLID CRYSTALLINE PRODUCTS IN A FUEL SYSTEM.

NOTE:
- Shock Treatment is defined as fueling the aircraft with fuel containing Biobor JF in concentrations of 270 ppm. This concentration is used if microbial growth is suspected. When using this concentration, check fuel filters for contamination twice at approximately 10-hour intervals.
- Preventive Treatment is defined as fueling the aircraft with fuel containing Biobor JF in concentrations of 135 ppm. This is for day-to-day type operations. When using this concentration, check fuel filters once after approximately 50 hours operation.

C. Refuel the Aircraft (See figure 302.)

WARNING:
- CERTAIN AVIATION GAS AND JET FUEL MIXTURE RATIOS CAN PRODUCE GREATER FLAMMABILITY HAZARDS UNDER PARTIALLY FILLED AIRCRAFT TANK OR STORAGE TANK CONDITIONS ENCOUNTERED DURING REFUELING OR MIXING. STRINGENT SAFETY PRECAUTIONS MUST BE OBSERVED WITH REGARD TO ESTABLISHED SAFETY STANDARDS TO ELIMINATE ANY POSSIBILITY OF SPARKS.
- STANDARD REFUELING SAFETY PRECAUTIONS MUST BE OBSERVED AT ALL TIMES.
- GROUND FUEL TRUCK TO AN APPROVED GROUND SOURCE. ATTACH GROUND FROM FUEL TRUCK TO NOSE GEAR UP-LATCH SPACER AND GROUND FUEL NOZZLE TO TIP TANK GROUND JACK.

WARNING: DO NOT ATTEMPT TO COMPLETELY FILL ONE TANK BEFORE ADDING FUEL TO THE OPPOSITE TANK AS EXCESSIVE LATERAL UNBALANCE WILL OCCUR. WHEN FUELING, FILL BOTH TIP TANKS SIMULTANEOUSLY OR ALTERNATELY ADD 125 GALLONS OF FUEL TO EACH TIP TANK UNTIL THE DESIRED AMOUNT IS OBTAINED.

(1) Remove tip tank filler caps and connect ground cables.
(2) Set Battery Switch(es) to ON.
(3) Set FUS VALVE Switch to OFF.
(4) Set Fuselage Tank Transfer Fill Switch to FILL. The crossflow valve and fuselage tank fuel valve (25C & 25F Aircraft have two fuselage tank fuel valves) are opened and both standby pumps are energized when Fuselage Tank Transfer Fill Switch is set to FILL. If crossflow valve or fuselage tank valve indicator lights are lighted, the valves are not in the position selected by the switch.

CAUTION: ON 25C/F AIRCRAFT, IF THE FUSELAGE TANK IS OVERFILLED DUE TO FUSELAGE TANK FLOAT SWITCH FAILURE AS EVIDENCED BY FUEL DRAINING FROM THE VENT SCOOPS UNDER THE WING, STOP FUSELAGE TANK FILL PROCEDURES IMMEDIATELY. SET XFER-FILL SWITCH TO OFF AND BATTERY SWITCHES TO OFF. FUEL SIPHONING MAY CONTINUE FOR AWHILE. DRAIN FUEL FROM THE FUEL VENT SYSTEM THROUGH THE FUEL VENT SYSTEM SUMP ASSEMBLY. IF THE VENT SYSTEM IS NOT DRAINED A VACUUM WILL RESULT WHEN FUSELAGE TANK FUEL IS TRANSFERRED. AFTER SUMP ASSEMBLY IS DRAINED TRANSFER FUEL TO THE WING TANKS. REMOVE, REPAIR OR REPLACE FUSELAGE TANK FLOAT SWITCH AS REQUIRED.

	25B/D Aircraft Without Fuel Jettison or Recognition Light		25B/D Aircraft Equipped With Fuel Jettison		25B/D Aircraft Equipped With Recognition Light		25B/D Aircraft Equipped With Fuel Jettison & Recognition Light	
TANKS	Total	Usable	Total	Usable	Total	Usable	Total	Usable
LH TIP U.S. METRIC	184 gal 696.4 L	184 gal 696.4 L	182 gal 688.9 L	182 gal 688.9 L	184 gal 696.4 L	184 gal 696.4 L	182 gal 688.9 L	182 gal 688.9 L
LH WING U.S. METRIC	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L
FUSELAGE U.S. METRIC	195 gal 738.0 L	195 gal 738.0 L	195 gal 738.0 L	195 gal 738.0 L	195 gal 738.0 L	195 gal 738.0 L	195 gal 738.0 L	195 gal 738.0 L
RH WING U.S. METRIC	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L
RH TIP U.S. METRIC	184 gal 696.4 L	184 gal 696.4 L	182 gal 688.9 L	182 gal 688.9 L	178 gal 673.7 L	178 gal 673.7 L	176 gal 666.1 L	176 gal 666.1 L
TOTAL U.S. METRIC	923 gal 3493.6 L	910 gal 3444.4 L	919 gal 3478.4 L	906 gal 3429.2L	917 gal 3470.8 L	904 gal 3421.6 L	913 gal 3455.7L	900 gal 3406.5 L

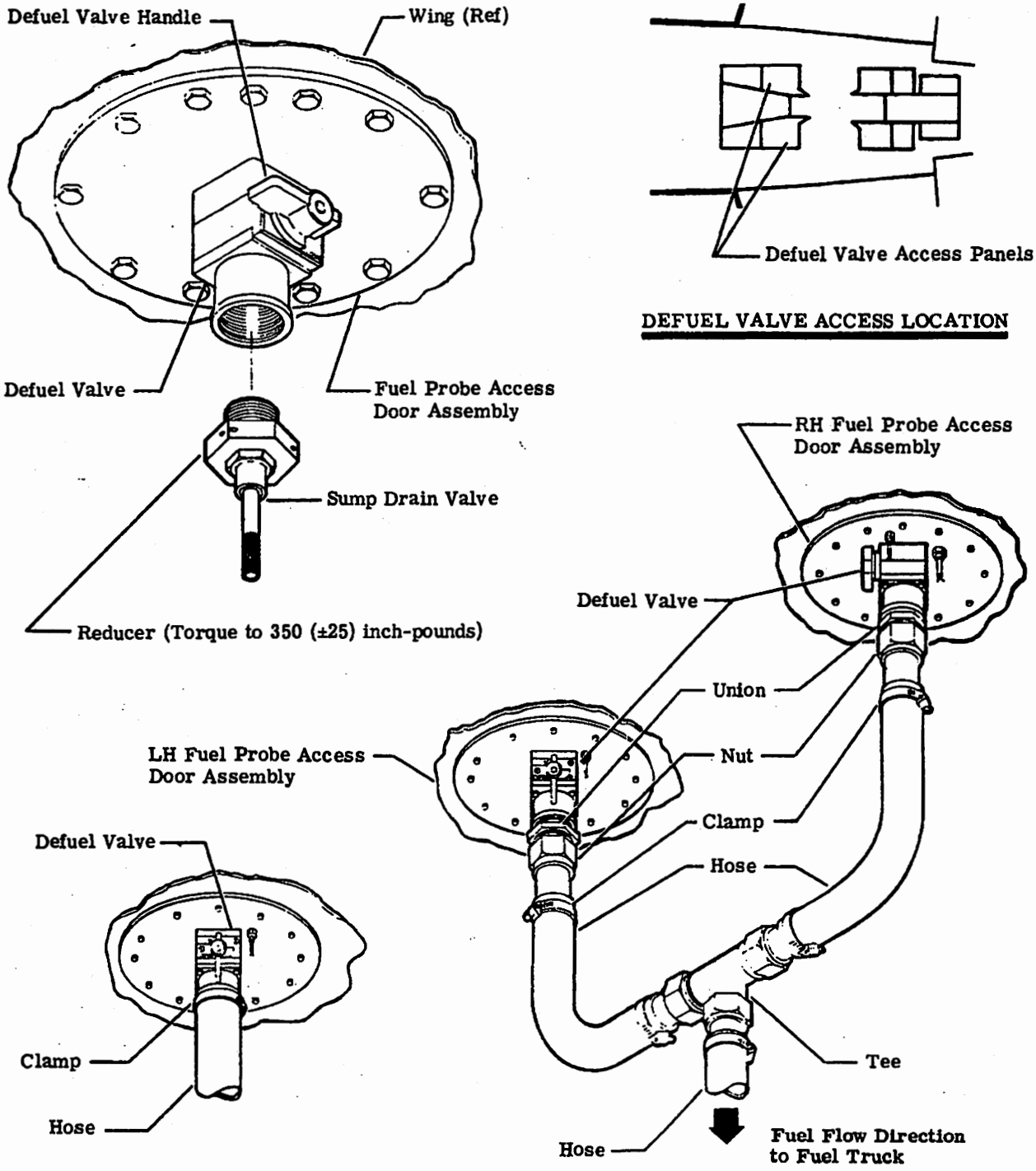
Fuel Capacities
Figure 302 (Sheet 1 of 3)

	25C/F Aircraft Without Fuel Jettison or Recognition Light		25C/F Aircraft Equipped With Fuel Jettison		25C/F Aircraft Equipped With Recognition Light		25C/F Aircraft Equipped With Fuel Jettison & Recognition Light	
TANKS	Total	Usable	Total	Usable	Total	Usable	Total	Usable
LH TIP U.S. METRIC	184 gal 696.4 L	184 gal 696.4 L	182 gal 688.9 L	182 gal 688.9 L	184 gal 696.4 L	184 gal 696.4 L	182 gal 688.9 L	182 gal 688.9 L
LH WING U.S. METRIC	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L
FUSELAGE U.S. METRIC	388 gal 1468.6 L	388 gal 1468.6 L	388 gal 1468.6 L	388 gal 1468.6 L	388 gal 1468.6 L	388 gal 1468.6 L	388 gal 1468.6 L	388 gal 1468.6 L
RH WING U.S. METRIC	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L
RH TIP U.S. METRIC	184 gal 696.4 L	184 gal 696.4 L	182 gal 688.9 L	182 gal 688.9 L	178 gal 673.7 L	178 gal 673.7 L	176 gal 666.1 L	176 gal 666.1 L
TOTAL U.S. METRIC	1116 gal 4224.0 L	1103 gal 4174.9 L	1112 gal 4208.9 L	1099 gal 4159.7 L	1110 gal 4201.4 L	1097 gal 4152.1 L	1106 gal 4186.2 L	1093 gal 4137.0 L

Fuel Capacities
Figure 302 (Sheet 2 of 3)

	25 B/D Aircraft United Kingdom With Fuel Jettison		25D/C Aircraft United Kingdom Without Fuel Jettison		25B/D Aircraft United Kingdom With Fuel Jettison		25B/D Aircraft United Kingdom Without Fuel Jettison	
TANKS	Total	Usable	Total	Usable	Total	Usable	Total	Usable
LH TIP U.S. METRIC	176 gal 666.1 L	176 gal 666.1 L	178 gal 673.7 L	178 gal 673.7 L	176 gal 666.1 L	176 gal 666.1 L	178 gal 673.7 L	178 gal 673.7 L
LH WING U.S. METRIC	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L
FUSELAGE U.S. METRIC	195 gal 738.0 L	195 gal 738.0 L	195 gal 738.0 L	195 gal 738.0 L	388 gal 1468.6 L	388 gal 1468.6 L	388 gal 1468.6 L	388 gal 1468.6 L
RH WING U.S. METRIC	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L	180 gal 681.3 L	173.5 gal 656.7 L
RH TIP U.S. METRIC	176 gal 666.1 L	176 gal 666.1 L	178 gal 673.7 L	178 gal 673.7 L	176 gal 666.1 L	176 gal 666.1 L	178 gal 673.7 L	178 gal 673.7 L
TOTAL U.S. METRIC	907 gal 3432.9 L	894 gal 3383.7 L	911 gal 3448.1 L	898 gal 3398.9 L	1100 gal 4163.5 L	1087 gal 4114.2 L	1104 gal 4178.6 L	1091 gal 4129.4 L

Fuel Capacities
Figure 302 (Sheet 3 of 3)



Aircraft Defueling
Figure 303

(5) Monitor fuselage tank FULL light to assure that valves close automatically when tank is full. Set Fuselage Tank Transfer Fill Switch to OFF.
(6) Set Battery Switch(es) to OFF when refueling is completed.
(7) Install tip tank filler caps and disconnect ground cables.

C. Defuel the Aircraft using Gravity Flow (See figure 303)

WARNING: GROUND CONTAINER TO NOSE GEAR UPLATCH SPACER AND AIRCRAFT TO AN APPROVED GROUNDING SOURCE PRIOR TO DEFUELING. THIS WILL PREVENT POSSIBLE FIRE OR EXPLOSION DUE TO STATIC ELECTRICAL SPARKS.

(1) Remove access panels and close defuel valves.
(2) Remove reducers and sump drain valves.
(3) Attach 1-3/8 inch inside diameter hoses to the defuel valve fittings. Hoses shall be of sufficient length to reach the container into which the fuel will flow.
(4) Remove both tip tank filler caps to facilitate fuel flow from the wings.

CAUTION: DEFUEL THE TANKS AS EVENLY AS POSSIBLE TO PREVENT AN UNBALANCED LOAD CONDITION.

(5) Open the defuel valves and drain the fuel into a suitable container. Fuel in the fuselage tank must be pumped into the wings for defueling using the normal fuel transfer procedure.
(6) Fuel remaining in the wing tip tanks must be siphoned.
(7) At the completion of the defuel operation, remove the hoses and install reducers and sump drain valves. Torque reducers to 350 (±25) inch-pounds and safety wire.
(8) Install access panels and tip tank filler caps.

D. Defuel the Aircraft using Suction Method (See figure 303)

WARNING: GROUND FUEL TRUCK TO AN APPROVED GROUND SOURCE. ATTACH GROUND FROM FUEL TRUCK TO NOSE GEAR UPLATCH SPACER AND GROUND FUEL HOSE TO AIRCRAFT. THIS WILL PREVENT POSSIBLE FIRE OR EXPLOSION DUE TO STATIC ELECTRICAL SPARKS.

(1) Remove access panels and close defuel valves.
(2) Remove reducers and sump drain valves.

CAUTION: PRIOR TO DEFUELING, REMOVE BOTH TIP TANK FILLER CAPS.

(3) Attach a suitable adapter to the defuel valve fittings and the fuel truck hose.

CAUTION: DEFUEL THE TANKS AS EVENLY AS POSSIBLE TO PREVENT AN UNBALANCED LOAD CONDITION.

(4) Open the defuel valves and use the suction from the pump of the fuel truck to draw fuel from the tanks. Fuel in the fuselage tank must be pumped into the wings for defueling using the normal fuel transfer procedure.
(5) Fuel remaining in the wing tip tanks must be siphoned.
(6) At the completion of the defuel operation, remove the adapter and install reducers and sump drain valves. Torque reducers to 350 (±25) inch-pounds and safety wire.
(7) Install access panels and tip tank filler caps.

ENGINE OIL SYSTEM - SERVICING

1. General
 - A. Engine oil system servicing consists of checking the oil level, adding oil, changing oil, cleaning oil filter, and flushing oil system.
 - B. Access to the oil filler and dipstick is gained through the oil servicing door located on the right side of each engine nacelle.
 - C. Access to the oil tank drain plug is gained by removing the lower engine nacelle. The oil tank is located on the bottom forward end of the engine. The oil tank drain plug incorporates the temperature sensing bulb. The accessory gear box magnetic drain plug is located on the forward end of the gear box.
 - D. When checking oil level, the engine must be static. Check oil level immediately after engine shutdown. A false indication of low oil may be obtained if the engine has remained inoperative for a length of time. This is due to oil seeping from the tank into the gear box.
 - E. Use approved oils only. Do not mix different types of oil. Oil should be filtered through a 10 micron filter immediately prior to use. Refer to Gates Learjet Airplane Flight Manual for Approved Oils.
 - F. The engine oil system must be flushed whenever type of oil is changed, whenever types of oil are mixed or whenever an unapproved oil is used.
 - G. For additional information on engine oil system, refer to General Electric CJ610 Maintenance Manual SEI-186.

2. Oil Level Check
 - A. Check engine oil level as follows:
 - (1) Open oil filler access door on outboard side of engine nacelle.
 - (2) Unlock oil filler cap and withdraw dipstick. Using a clean rag, wipe oil from dipstick and reinsert dipstick.
 - (3) Again withdraw dipstick and check oil level against markings on dipstick.

3. Adding Oil
 - A. Whenever engine oil level is low oil should be added as follows:
 - (1) Unlock and remove oil filler cap.
 - (2) Fill oil tank with an approved oil that has been filtered with a 10 micron filter until dipstick indicates full.
 - (3) Reinstall and lock oil filler cap.

4. Changing Oil
 - A. Drain oil as follows:
 - (1) Gain access to and remove the oil filler cap.
 - (2) Remove lower engine nacelle.
 - (3) Remove the temperature sensing bulb from the oil tank.
 - (4) Remove the magnetic drain plug from the accessory gear box.
 - (5) After draining oil into a suitable container, remove oil filter.

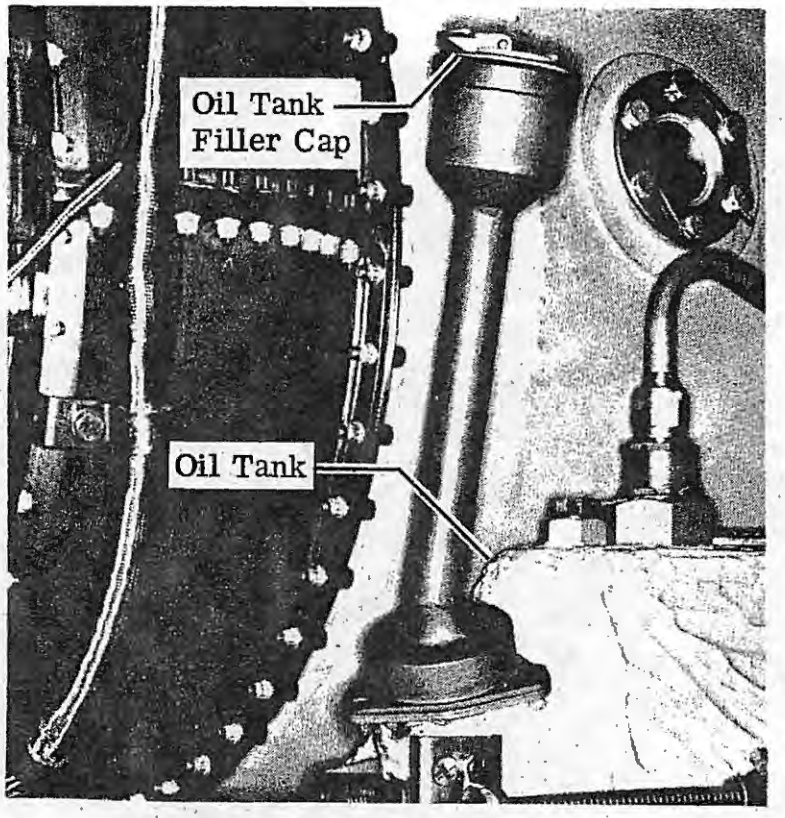
(6) Inspect the magnetic drain plug, oil filter and oil for metallic particles. If metallic particles are found, perform a metallic particle check in accordance with General Electric CJ610 Maintenance Manual SEI-186.

B. Clean oil filter and magnetic drain plug as follows:
(1) Clean filter element in trichlorethane, kerosene or an equivalent solvent.
(2) Using filtered compressed air, blow out excess solvent and assure that no dirt particles have collected in element.
(3) Inspect filter for cleanliness and if not completely clean repeat steps (1) and (2) until sloshing in clean solvent produces no solvent contamination.
(4) Clean magnetic drain plug using trichlorethane, kerosene, or an equivalent solvent.
(5) Install new O-rings on magnetic drain plug and on filter and install on engine.
(6) Install temperature sensing bulb in oil tank.

C. Replenish oil as follows:
(1) Using the same type and brand of oil that is presently in the system, fill the oil tank to the FULL mark on the dipstick. Assure that oil has been filtered through a 10 micron filter.
(2) After the first engine run the engine will require additional oil to bring the oil level to the FULL mark. This is due to a small amount of oil remaining in the sumps and oil lines after engine shutdown.

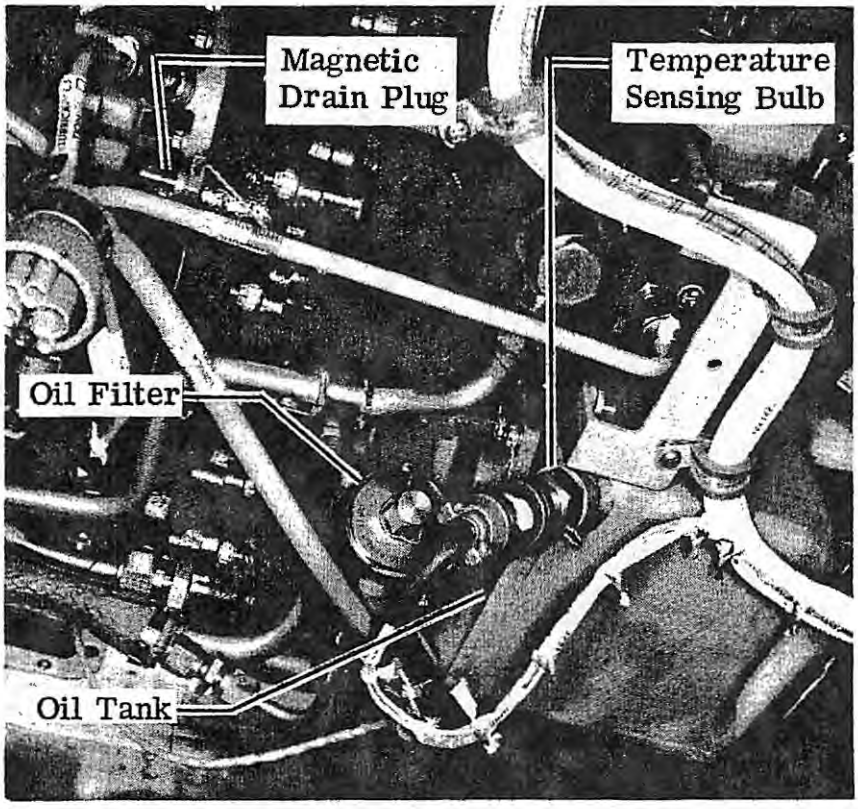
5. Flushing Oil System

A. The engine oil system must be flushed whenever type of oil is changed, types of oil are mixed, or whenever an unapproved oil has been used. Flush oil system as follows:
(1) Drain engine oil and clean oil filter and magnetic drain plug. Refer to Changing Oil.
(2) Replenish oil using the desired oil. Refer to Changing Oil.
(3) Start and run engine for five minutes and then shut down.
(4) Change the oil, again using the desired oil, in accordance with Changing Oil.
(5) Tag the oil filler with the type and brand of oil being used.
(6) After engine has been operated in service for 15 to 35 hours, check oil filter and clean as required. Refer to Metallic Particle Check in General Electric CJ610 Maintenance Manual SEI-186.



LOOKING AT RIGHT SIDE OF ENGINE

Engine Oil System Servicing
Figure 301 (Sheet 1 of 2)



LOOKING AT LOWER SIDE OF ENGINE

Engine Oil System Servicing
Figure 301 (Sheet 2 of 2)

LUBRICATION - DESCRIPTION AND OPERATION

1. General
 A. Scheduled lubrication of the aircraft is performed in conjunction with Current Inspection Intervals. (Refer to 5-00-00)
 B. When lubricating the aircraft, the following standard lubrication service notes should be followed.
 (1) Cleanliness is of utmost importance during aircraft lubrication. Never use more than one kind of lubricant in a grease gun or oil can.
 (2) Prior to lubrication all fittings and oil holes should be cleaned with a clean, dry cloth.
 (3) After lubricating a part wipe all excess lubricant from all but the working parts.
 (4) When lubricating a vented fitting, lubricate until all old grease is extruded at point being lubricated.

2. Recommended Lubricants

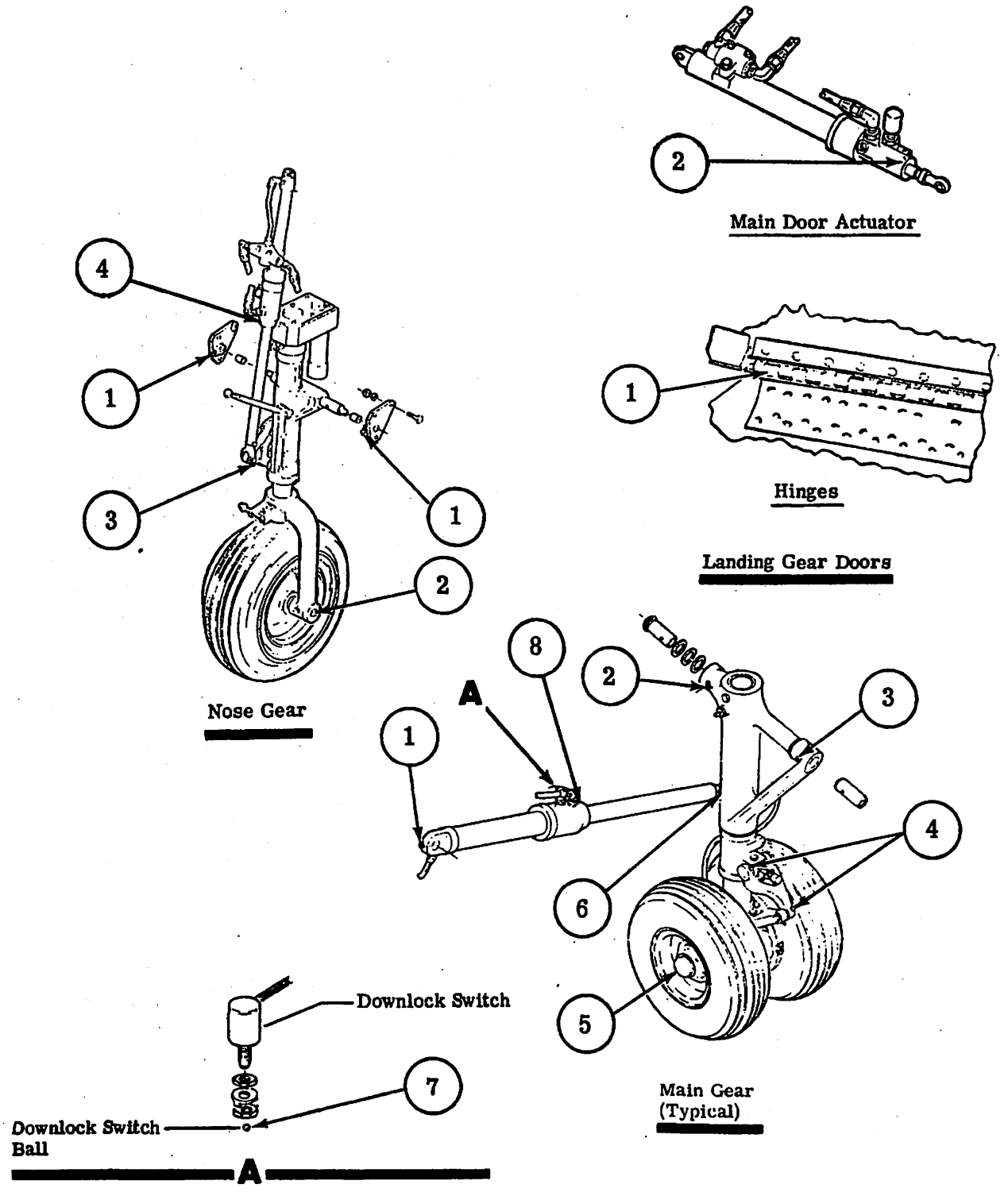
A. The following chart contains the symbols which appear on the individual lubrication illustrations. These symbols are to be cross referenced from the illustrations.

Symbol	Type of Lubricant	Principal Use	Procurement Specification	Recommended Product
CSP	High Temperature Thread Compound			FEL-PRO C-5 (Feld Products Mfg. Co.)
GHT	Grease, Aircraft, General Purpose Wide Temperature Range	Wheel Bearings and Zerks	MIL-G-81322	
OHA	Hydraulic Fluid, Petroleum Base, Aircraft Ordinance	Hydraulic System and Gear Struts	MIL-H-5606	
OGP	Lubricating Oil, General Purpose Low Temperature	Oil Can Applications	MIL-L-7870	
✸	Grease	Starter-Generator	MIL-G-81827	Mobil Grease No. 29 or Braycote 664S (Bray Oil Co.)
*	Grease	Actuator Downlock Ball		LPS3 (LPS Research Laboratories, Inc.)
● ●	Spray Lubricant	Drag Chute Mechanism		LPS 1 (LPS Research Laboratories, Inc.) or WD-40 (WD-Forty(40) Co.)

LANDING GEAR - SCHEDULED LUBRICATION

1. General
 A. Main gear lubrication points consist of forward and aft trunnion pins, actuator attach points, actuator downlock balls, torque arm bushings, wheel axle and strut cylinder.
 B. Landing gear door lubrication consists of lubricating the hinges.
 C. Nose gear lubrication points consist of both trunnion pins, actuator attach point, wheel axle and strut cylinder.

2. Servicing
 A. When lubricating the landing gear door hinges, squirt with an oil can so that oil penetrates into hinge then wipe excess oil from hinge.
 B. In addition to the 150 hour requirement for lubricating the nose gear axle, at each 1200 hour interval the wheel must be removed, the axle cleaned and inspected for corrosion. After inspection apply GHT grease to the axle external surface and apply zinc chromate primer to axle inner surface.
 C. In addition to the 150 hour requirement for lubricating the main gear axles, at each 1200 hour interval the wheels must be removed, the axles cleaned and inspected for corrosion. After inspection apply GHT grease to the axle external surface and apply Rust-Oleum to axle inner surface.



Landing Gear and Door Lubrication
Figure 301 (Sheet 1 of 3)

NOSE GEAR RECOMMENDED LUBRICATION CHART

Item No.	Item Description	Lube Type	Application Method	Frequency
1	Trunnion Pin	GHT	Gun	150 Hrs. or 6 Mo.
2	Wheel Bearings, Bearing Cups and Axle	GHT	Hand	150 Hrs. and Every Tire Change
3	Actuator Attach Fitting	GHT	Gun	150 Hrs.
4	Piston Rod Felt Wiper	OHA	Oil Can	600 Hrs.

NOSE AND MAIN GEAR DOOR RECOMMENDED LUBRICATION CHART

Item No.	Item Description	Lube Type	Application Method	Frequency
1	Gear Door Hinges	OGP	Oil Can	6 Months
2	Piston Rod Felt Wiper	OHA	Oil Can	600 Hrs.

MAIN GEAR RECOMMENDED LUBRICATION CHART

Item No.	Item Description	Lube Type	Application Method	Frequency
1	Actuator/Wing Attach Point	GHT	Gun	150 Hrs.
2	Aft Trunnion Pin	GHT	Gun	150 Hrs.
3	Fwd Trunnion Pin	GHT	Gun	150 Hrs.
4	Torque Arm Bushings	GHT	Gun	150 Hrs.
5	Wheel Bearings, Bearing Cups and Axle	GHT	Hand	150 Hrs. and Every Tire Change

Landing Gear and Door Lubrication
Figure 301 (Sheet 2 of 3)

MAIN GEAR RECOMMENDED LUBRICATION CHART (CONTINUED)

Item No.	Item Description	Lube Type	Application Method	Frequency
6	Actuator/Strut Attach Point	GHT	Gun	150 Hrs.
7	Actuator Downlock Ball	LPS3	Hand	600 Hrs.
8	Piston Rod Felt Wiper	OHA	Oil Can	600 Hrs.

GHT - Grease, Wide Temperature Range (MIL-G-81322)

OGP - Oil, Low Temperature Range (MIL-L-7870)

OHA - Hydraulic Fluid (MIL-H-5606)

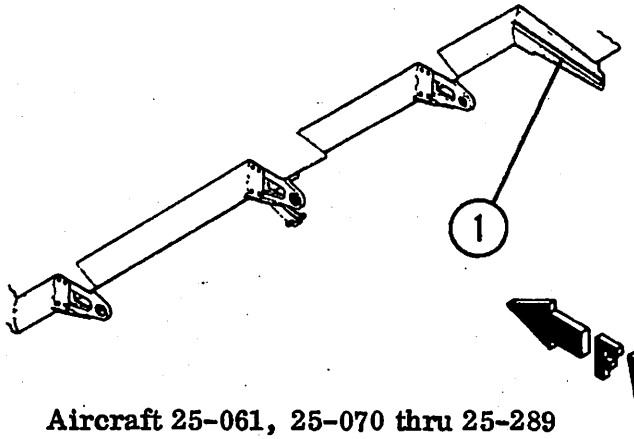
LPS3 - Grease (LPS Research Laboratories Inc., Los Angeles, Calif.)

Landing Gear and Door Lubrication
Figure 301 (Sheet 3 of 3)

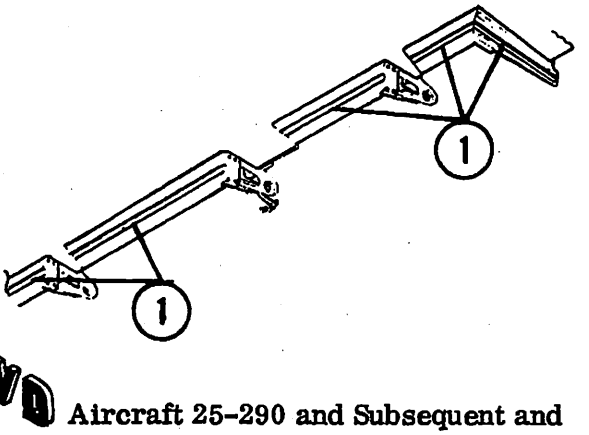
FLIGHT CONTROLS - SCHEDULED LUBRICATION

1. General
 A. Lubrication of the flight controls consists of lubricating the rudder pedals, flap track rollers and the aileron brush seals.

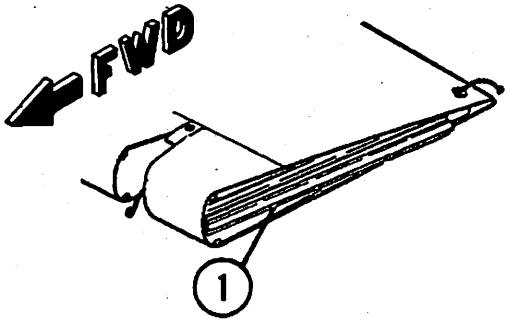
2. Servicing
 A. The aileron brush seals are to be lubricated at each 300 hour interval with a light coat of Dow Corning No. 33 grease.
 B. The rudder pedal bushings are to be lubricated on installation with a low temperature range oil.
 C. The flap track rollers are to be lubricated every 150 hours. When lubricating the flap track rollers a 90° rubber adapter (Alemite P/N 327265) must be attached to the grease gun in order to reach lube points. There are 16 flap track rollers (8 in each wing) which must be lubricated.
 D. The flap actuator piston rod felt wiper is to be lubricated every 600 hours. Apply 2 to 3 drops of hydraulic fluid thru lubrication hole on flap actuator.



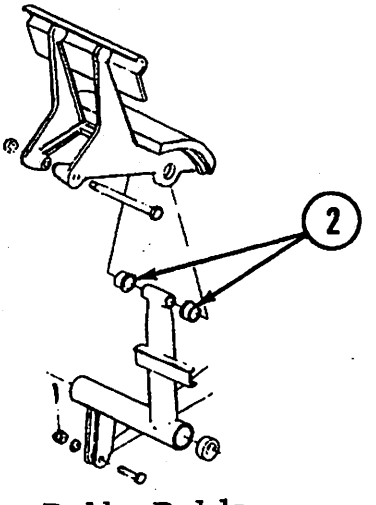
Aircraft 25-061, 25-070 thru 25-289
Not Modified per AAK 79-10.



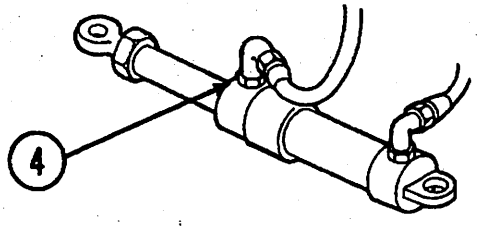
Aircraft 25-290 and Subsequent and
Aircraft 25-061, 25-070 thru 25-189
Modified per AAK 79-10.



Aileron Brush
Seals (Typical)

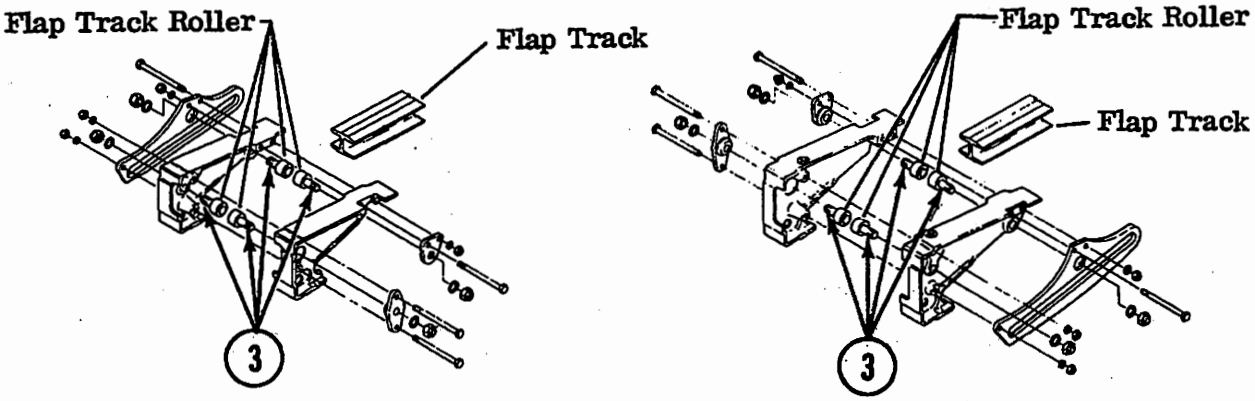


Rudder Pedals
(Typical)



Flap Actuator (Typical)

Flight Controls Lubrication
Figure 301 (Sheet 1 of 2)



Outboard Flap Track Assembly

Inboard Flap Track Assembly

TYPICAL BOTH WINGS

FLIGHT CONTROLS RECOMMENDED LUBRICATION CHART

Item No.	Item Description	Lube Type	Application Method	Frequency
1	Aileron Brush Seals	GDC	Hand	300 Hours
2	Rudder Pedal Bushings	OGP	Oil Can	On Installation
3	Flap Track Rollers	GHT	Zerk Guns with 90° Rubber Adapter (Alemite P/N 327265)	150 Hours
4	Piston Rod Felt Wiper	OHA	Oil Can	600 Hours

GDC - Grease, Dow Corning (No. 33)

GHT - Grease, Wide Temperature Range (MIL-G-81322)

OGP - Oil, Low Temperature Range (MIL-L-7870)

OHA - Hydraulic Fluid (MIL-H-5606)

Flight Controls Lubrication
Figure 301 (Sheet 2 of 2)

DRAG CHUTE - SCHEDULED LUBRICATION

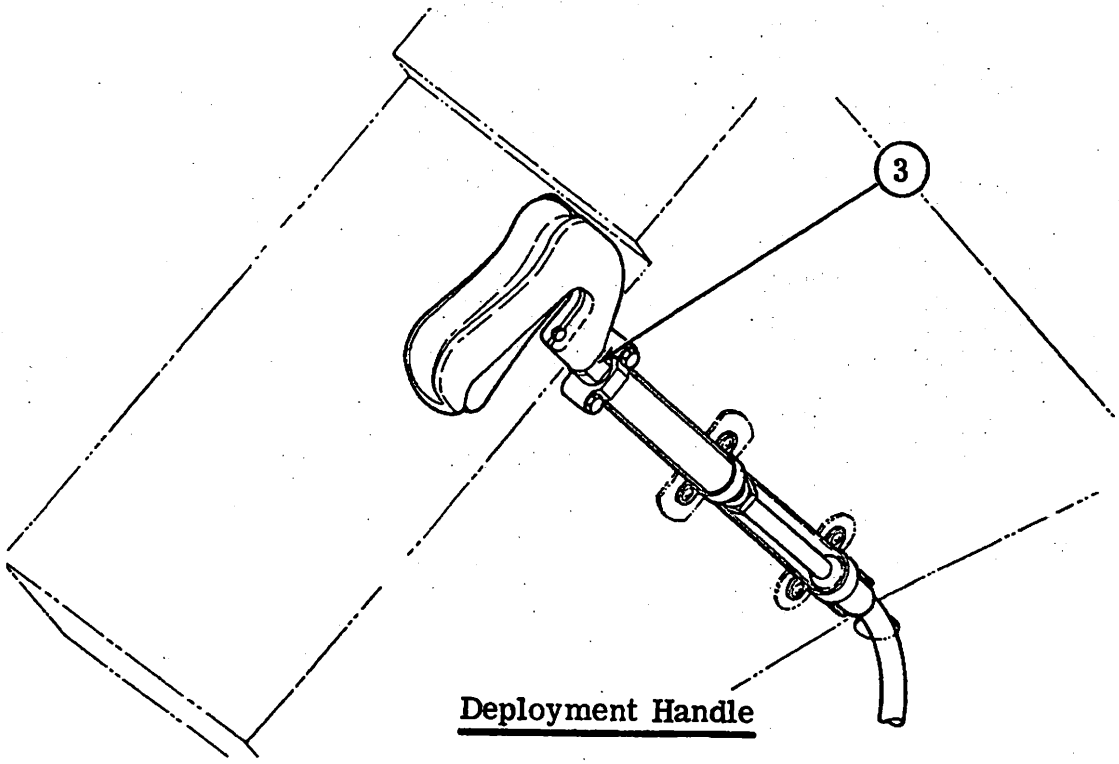
1. General

A. Lubrication of the drag chute consists of using a spray lubricant to lubricate the latch mechanism bearing points, canister ring rollers, and the deployment shaft handle.

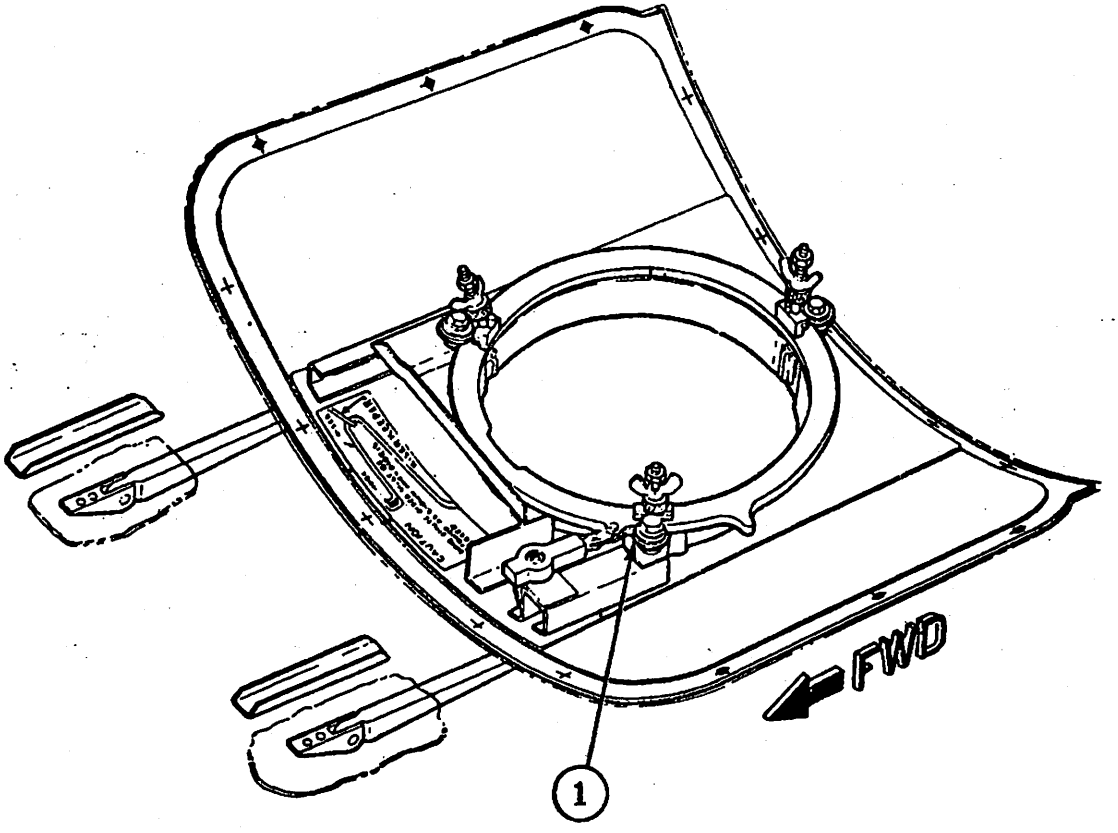
DRAG CHUTE RECOMMENDED LUBRICATION CHART

Item No.	Item Description	Lube Type	Application Method	Frequency
1	Canister Ring Rollers	● ●	Spray	150 Hrs.
2	Latch Mechanism Bearing Points	● ●	Spray	150 Hrs.
3	Deployment Handle Shaft	● ●	Spray	150 Hrs.

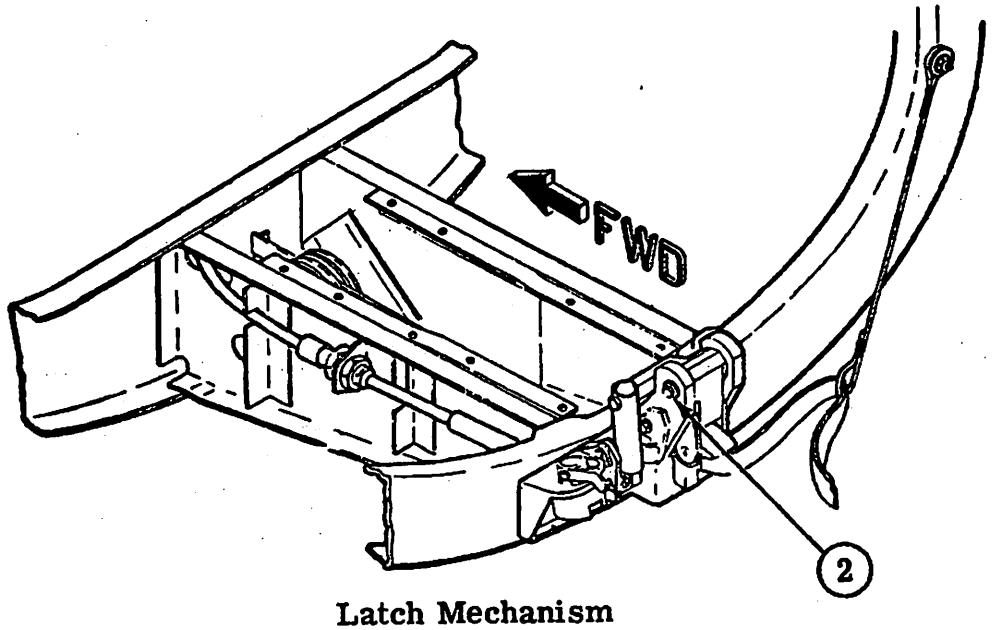
● ●-Lubricant Spray - LPS1 or WD-40



Drag Chute Installation
Figure 301 (Sheet 1 of 2)



Canister Ring



Latch Mechanism

Drag Chute Installation
Figure 301 (Sheet 2 of 2)

ENGINE ACCESSORY - SCHEDULED LUBRICATION

1. General

A. Engine accessory lubrication consists of lubricating the EPR connections, starter-generator, hydraulic pump and throttle cable ball joint connectors.

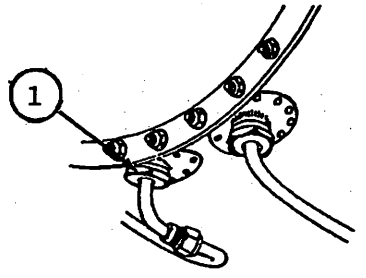
ENGINE ACCESSORY RECOMMENDED LUBRICATION CHART

Item No.	Item Description	Lube Type	Application Method	Frequency
1	EPR Connection to Engine	CSP	Hand	On Installation & As Required.
2	Starter-Generator (Male Spline)	✸	Hand	150 Hrs., On Installation & As Required.
3	Hydraulic Pump (6600301-1 Only)	✸	Hand	On Installation & As Required.
4	Throttle Ball Joint Connector	GHT	Hand	300 Hrs.

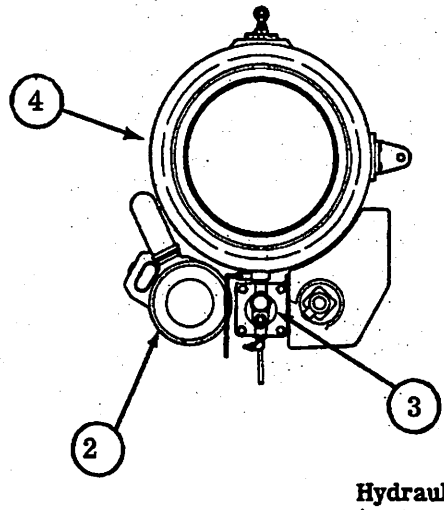
CSP - High Temperature Thread Compound

GHT - Grease, Wide Temperature Range (MIL-G-81322)

✸ - Grease (MIL-G-81827)



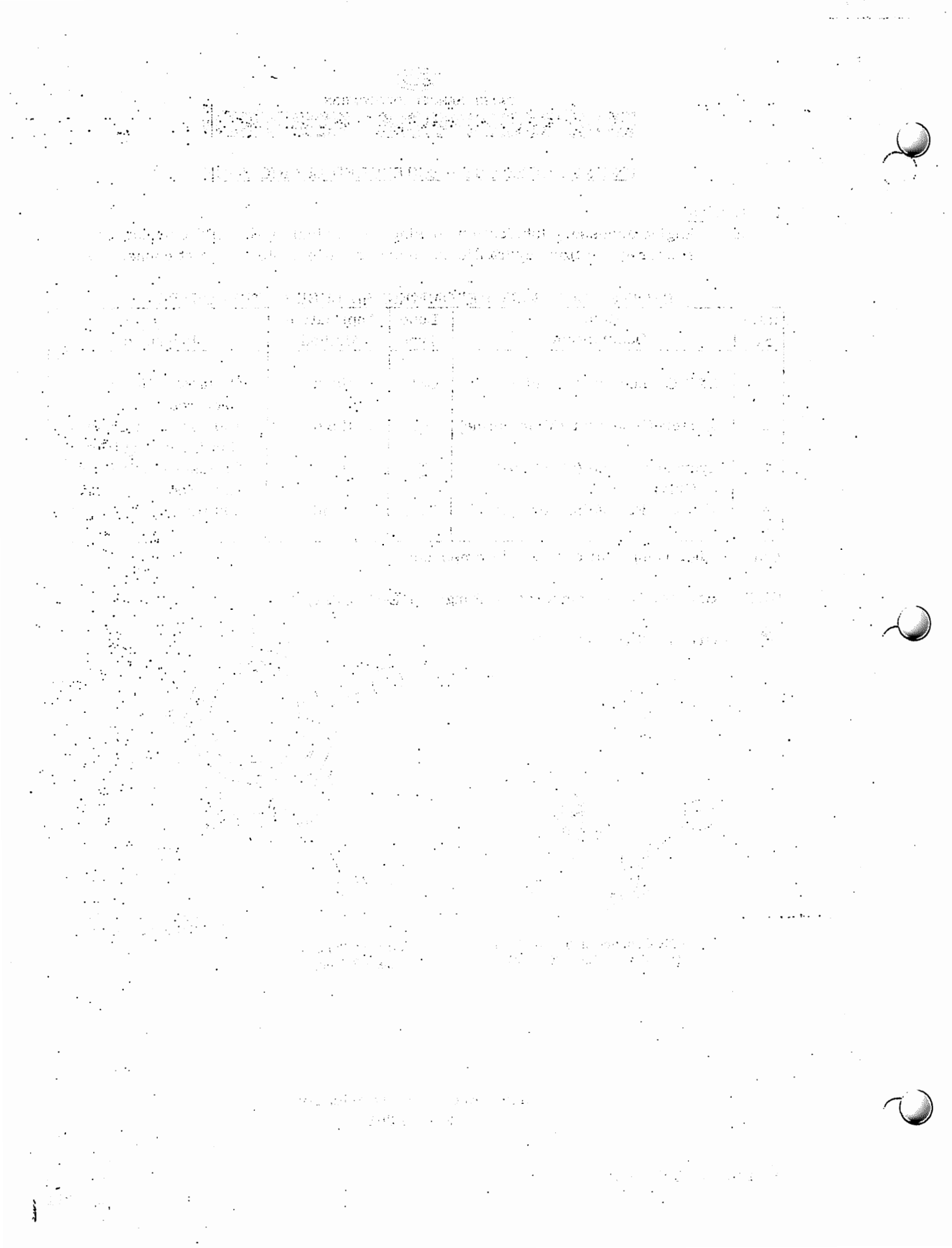
EPR Connection To Engines
(Two Places Each Engine)



Starter Generator
(Male Spline)

Hydraulic Pump
(Male Spline)

Engine Accessory Lubrication
Figure 301



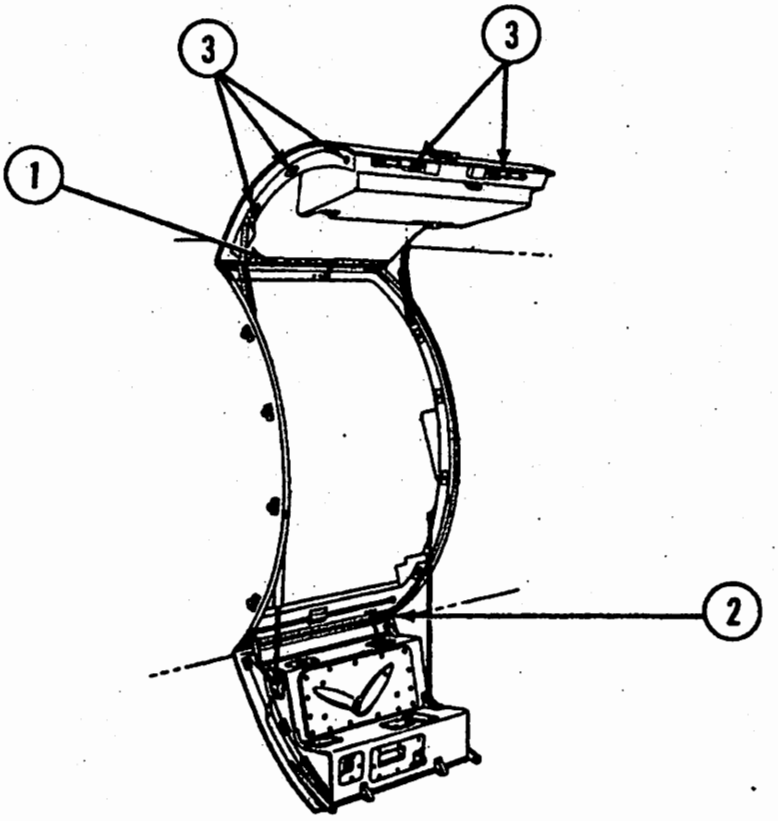
CABIN ENTRANCE DOOR - SCHEDULED LUBRICATION

1. Lubrication

CABIN ENTRANCE DOOR RECOMMENDED LUBRICATION CHART

Item No.	Item Description	Lube Type	Application Method	Frequency
1	Upper Piano Hinge	OGP	Oil Can	6 Months
2	Lower Piano Hinge	OGP	Oil Can	6 Months
3	Latch Mechanism (Pins)	GHT	Hand	6 Months

OGP - Oil, Low Temperature Range (MIL-L-7870)
GHT - Grease, Wide Temperature Range (MIL-G-81322)



Cabin Entrance Door Lubrication
Figure 301

BATTERIES - SCHEDULED SERVICING

1. General

A. The aircraft is equipped with either two 22 ampere-hour nickel cadmium batteries, two 40 ampere-hour nickel cadmium batteries or two 45 ampere-hour lead acid batteries.

B. For information not covered in this manual. refer to manufacturer's instructions listed under "Supplementary Publications", in the introduction of this manual.

C. Access to the batteries is through the tailcone access door.

D. To prolong the service life of the aircraft batteries, the batteries must be submitted to a discharge-recharge reconditioning cycle in accordance with current inspection intervals. Refer to 5-00-00. This procedure must also be performed any time the battery overheat warning light comes on. It is recommended that the manufacturer's instructions be used in order to avoid confusion of the different types and brands of batteries. Refer to "Supplementary Publications" in the introduction of this manual for information on how to procure manufacturer's data.

E. When servicing nickel cadmium batteries, adhere closely to the following maintenance precautions.

(1) The batteries are alkaline type and require absolute internal cleanliness. Avoid any contamination.

(2) Do not use any tools, jars, or instruments in common with acid batteries. Acid and alkali do not mix.

(3) Alkaline electrolyte has a strong corrosive effect on most metals. In case of spills, immediately neutralize area with either a solution of six ounces of boric acid to one gallon water or a solution of one part vinegar to three parts water. Do not flush with water prior to neutralizing as this will only enlarge the area of contamination. Do not neutralize battery.

(4) Alkaline electrolyte is harmful to human skin. If a splash occurs, immediately rinse area with water then neutralize with either a solution of six ounces boric acid to one gallon water or a solution of one part vinegar to three parts water followed by washing with soap and water. Remove contaminated clothing to prevent slow burns to skin. If electrolyte gets into eyes, wash with boric acid solution (six ounces to one gallon water) and consult physician. Be sure to advise the physician that the electrolyte was alkali not acid.

(5) Do not use a wire brush to clean cells. Use a bristle brush and water. Remove batteries from aircraft when using water.

(6) Under no circumstances should the battery be lifted by its electrical connector.

F. When servicing lead acid batteries, adhere closely to the following maintenance precautions.

(1) Hydrogen gas, given off during charging and shortly after charging, is highly explosive. Open flame and sparks must be avoided in these areas.

(2) Turn battery charger off before connecting battery to charger and before removing battery from charger.

(3) Battery charging area must be well ventilated.

(4) Sulfuric acid in the electrolyte is injurious to skin. If acid is spilled, neutralize at once with a water solution of sodium bicarbonate (baking soda).

(5) When mixing electrolyte, always pour acid into water, do not pour water into acid. Use only glass, hard rubber or other suitable container for mixing electrolyte.

(6) Do not use freshly prepared electrolyte until it has cooled to 90° F (32.2° C) or less. The considerable heat of fresh electrolyte may damage the battery.

(7) Do not use a wire brush to clean batteries. Use a bristle brush and water. Remove batteries from aircraft when using water.

(8) Do not use any tools, jars, or instruments in common with nickel cadmium batteries.

2. Servicing (Nickel Cadmium Batteries)

A. Check Battery Liquid Level (Nickel Cadmium Batteries)

(1) Remove vent plugs.

(2) Check for proper electrolyte level above baffles (on Marathon batteries, 1/8" at 2 to 4 hours after battery has been fully charged, and 1/16" after 5 to 7 hours; on Gulton batteries 3/8" to 1/2" from 2 to 24 hours after battery has been fully charged). Adjust if required. Use only distilled, deionized or demineralized water for liquid level adjustment. Tap water may contaminate batteries.

NOTE: When servicing the batteries, do not confuse the Liquid Level Check with Checking Electrolyte Specific Gravity.

(3) Do not add water when battery is in a discharged state unless cell voltage reading of greater than 1.5 volts is encountered immediately after placing the battery on charge. The cell may be dry. If so, add about 22 cc of water for a 22 ampere-hour cell (40 cc for 40 ampere-hour cell) to the cell or cells showing this high voltage.

B. Determine State of Battery Charge (Nickel Cadmium Batteries)

(1) The true state of charge of a nickel-cadmium battery is difficult to determine. However, whether or not the battery is almost fully charged, can be determined by observing the charging current taken from a charging source of some accurately determined voltage.

(2) To verify that the battery is well charged, connect it across a voltage source of 28.5 ±5 volts. If the current drops to 1 to 4 amperes within a few minutes and remains almost stable at this low value, the battery can be assumed to be at least 85% charged.

(3) Open circuit voltage can be used for only a general indication of state of charge. Normally, an open circuit voltage of 21 volts or less indicates a discharged battery; 24.5 volts or more indicates a charged battery. Abnormal temperatures, long storage, and other factors affect the above voltage values considerably.

C. Charge Battery (Bench) (Nickel Cadmium Batteries)

(1) The factory recommends that the battery be charged using the constant current method at the following rates; however, there are alternate charging methods. Refer to the manufacturer's instructions listed under "Supplementary Publications" in the introduction of this manual.

(a) Charge 22 ampere-hour batteries at a rate of 5 amperes for seven hours.

(b) Charge 40-ampere hour batteries at a rate of 8 amperes for seven hours.

D. Charging Batteries (In Aircraft) (Nickel-Cadmimum Batteries)

WARNING: BATTERY VOLTAGE MUST BE AT LEAST 20.5 VOLTS, UNDER NO LOAD CONDITIONS, BEFORE ATTEMPTING TO CHARGE THE BATTERIES WITH A GROUND POWER UNIT. CHARGING TOO LOW A BATTERY COULD CAUSE SEVERE DAMAGE DUE TO POSSIBLE CELL POLARITY REVERSALS. BATTERY TEMPERATURE SHALL BE NO MORE THAN 100°F (37.8°C) BEFORE BEGINNING CHARGE. TEMPERATURE RISE DURING CHARGE SHALL NOT EXCEED 15°F (9.4°C). BATTERY TEMPERATURE MUST BE MONITORED DURING CHARGING.

(1) Because of the poor regulation of most ground power units, it is not recommended that the batteries be charged in the aircraft.

(2) In no case shall batteries be charged in the aircraft if battery voltage is less than 20.5 volts under no load conditions (battery must be removed for charging).

(3) In no case shall batteries be charged in the aircraft if battery temperature is above 100°F (37.8°C). (Battery must be removed for charging.)

(4) Should it become absolutely necessary to charge the batteries in the aircraft, assure that voltage is above 20.5 and that temperature is below 100°F (37.8°C) then charge batteries in the following manner:

(a) Set all aircraft switches to OFF.
(b) Plug ground power unit (28 ±0.5 volts, 1000 amps maximum) into external power receptacle.
(c) On Aircraft 25-090, 25-103 and Subsequent, set Battery Switches to BAT 1 and BAT 2.

NOTE: On Aircraft 25-070 thru 25-089 and 25-091 thru 25-102, electrical power is applied directly to the batteries' charging bus when external power receptacle is connected.

(d) Continuously monitor battery temperature during charge. Maximum permissible temperature rise is 15°F (9.4°C).
(e) Continuously monitor voltage and amperage during charge.

E. Perform Battery Discharge-Recharge Reconditioning Cycle (Nickel-Cadmium Batteries)
(1) Remove batteries from aircraft. Refer to 24-32-01.
(2) Remove cover from battery.
(3) Visually inspect battery for any evidence of corrosion or physical damage.

CAUTION: UNDER NO CIRCUMSTANCES SHOULD A WIRE BRUSH BE USED FOR CLEANING. WHEN CLEANING BATTERIES, USE EXTREME CARE TO PREVENT THIS MATERIAL FROM COMING IN CONTACT WITH THE EYES. PROTECTIVE CLOTHING SUCH AS RUBBER GLOVES, AN APRON AND FACE SHIELD SHOULD BE WORN.

(4) Assure that all vent plugs are tight. Tip battery to side opposite receptacle and clean using a soft bristle brush and tap water. Dry off excess water with an air hose.
(5) Charge the 22-ampere hour batteries at a rate of 5 amperes for seven hours and the 40-ampere hour batteries at a rate of 8 amperes for seven hours.
(6) Check for proper electrolyte level above baffles (on Marathon batteries, 1/8" at 2 to 4 hours after battery has been fully charged, and 1/16" after 5 to 7 hours; on Gulton batteries 3/8" to 1/2" from 2 to 24 hours after battery has been fully charged). Adjust if required.

NOTE: Use only distilled, deionized or demineralized water for liquid level adjustment. Tap water may contaminate batteries.

(7) Discharge 22-ampere hour batteries at a rate of 10 amperes for two

hours and the 40-ampere hour batteries at a rate of 17 amperes for two hours. Discharge down to 19 volts (1.0 volt per cell average).

(8) Monitor total battery voltage during discharge and record the time from start of discharge until total battery voltage drops to 19 volts.

(9) If the discharge time down to total battery voltage of 19 volts was greater than 90 minutes, the battery is ready for a complete charge cycle, proceed to step (15). (If this is in accordance with current inspection intervals, steps (11) thru (13) must be performed.)

(10) If the discharge time down to total battery voltage of 19 volts was less than 90 minutes, it must be further discharged as follows.

(11) Continue discharge, as outlined in step (7) while monitoring individual cell voltage.

(12) As each individual cell drops to 0.6 volt, place a metal shoring strap across the cell terminals until all cells are shorted.

(13) If any cell fails to drop to 0.6 volt, place a 1.0 ohm resistor of 1 or 2 watts across the terminals.

(14) Let battery stand for three or more hours or until it has cooled to room temperature. After battery has cooled, remove shorting straps.

(15) Charge the 22-ampere hour batteries at a rate of 5 amperes for seven hours and the 40-ampere hour batteries at a rate of 8 amperes for seven hours.

(16) During the final five minutes of charge, read individual cell voltages. Mark any cell which is less than 1.55 volts. Mark any cell which peaks above 1.55 volts then decreases below 1.50 volts. Mark any cell which is in excess of 1.75 volts. Remove marked cells from service and replace.

(17) Replace cover on battery.

(18) Reinstall battery in aircraft. Refer to 24-32-01.

3. Servicing (Lead Acid Battery)

A. Prepare Dry Charged Battery for Service (Lead Acid Batteries)

(1) Remove any special sealing from the vent plugs or filler holes as the case may be.

(2) Prepare electrolyte (diluted sulfuric acid) by mixing one part by volume of pure concentrated sulfuric acid (1.835 specifig gravity) with three parts by volume of distilled water. The specific gravity of prepared electrolyte should be 1.280 to 1.290 at 80°F (26.7°C).

(3) After electrolyte has cooled to 90°F (32.2°C) or less, fill each cell to 1/8" below split rings.

(4) Let battery stand for one hour.

(5) At the end of one hour, rock the battery from side to side and end to end to allow trapped air at the bottom of the cells to escape.

(6) Recheck electrolyte level and add electrolyte as required to bring level 1/8" below split rings until terminal voltage shows no change for 3 consecutive hours.

(7) Clean any spilled electrolyte from battery using a cloth dampened in a neutralizing solution. Do not allow any neutralizing solution to enter cells.

NOTE: Battery freshening charge must be performed within 10 hours after electrolyte is added.

CAUTION: CELL TEMPERATURE MUST NOT EXCEED 115°F (46.1°C) DURING CHARGING. CELL TEMPERATURES MAY BE KEPT LOW BY REDUCING CHARGING AMPERAGE. CELL TEMPERATURE IS CHECKED BY INSERTING A GLASS THERMOMETER INTO THE ELECTROLYTE.

(8) Charge the battery using the constant current method. Charge at 3 amperes until terminal voltage shows no change for 3 consecutive hours.

(9) Again check specific gravity. If specific gravity is not between 1.280 and 1.290 the electrolyte must be adjusted by removing electrolyte and adding distilled water or stronger electrolyte.

(10) If electrolyte was adjusted, an additional one hour charge is necessary before retesting electrolyte specific gravity.

(11) Install vent plugs and wash off battery using a cloth dampened with neutralizing solution.

B. Check Battery Liquid Level (Lead Acid Batteries)

(1) Remove Battery Liquid Level (Lead Acid Batteries)

(2) Check for proper electrolyte level above separators. Electrolyte should be 1/8" below the split rings when battery is fully charged.

NOTE: Do not confuse the liquid level check with checking electrolyte specific gravity.

CAUTION: IT IS EXTREMELY IMPORTANT THAT A GOOD SEAL IS ACHIEVED BETWEEN THE BATTERY VENT PLUG, RUBBER GASKET, AND BATTERY TO PREVENT ELECTROLYTE LEAKAGE. LEAKING ELECTROLYTE WILL CREATE A SELF-DISCHARGE PATH AND WILL CAUSE DAMAGE TO STRUCTURE OR EQUIPMENT.

(3) Install battery vent plugs, assuring that vent plugs are securely in place and a good seal is obtained.

C. Determining State of Battery Charge (Lead Acid Batteries)

(1) The state of battery charge is determined by the physical and chemical condition of the battery. An old battery may take a full charge and still have very little capacity due to the small amount of active material left in the plates for chemical reaction.

(2) To verify that the battery is well charged, the specific gravity is the best indication. Keep in mind when checking specific gravity that specific gravity varies inversely with the temperature of the electrolyte and that specific gravity varies directly with battery charge.

(3) Samples of electrolyte should be taken from each cell and returned to that same cell. Samples should only be taken after battery has been fully charged.

(4) Use a clean hydrometer and read specific gravity of each cell. If at all practical, take hydrometer readings when electrolyte is between 70°F (21.1°C) and 90°F (32.3°C); this will eliminate the need to add or subtract a temperature correction factor. If temperature is below 70°F (21.1°C) or above 90°F (32.2°C) a correction factor must be figured into the reading. Some hydrometers have a correction factor scale inside the tube. If no correction factor scale is in the tube, then use the table in figure 301.

(5) The specific gravity of a fully charged battery should be between 1.280 and 1.290.

ELECTROLYTE TEMPERATURE SPECIFIC GRAVITY CORRECTION TO 80°F (26.7°C)

°C	°F	ADD TO READING	SUBTRACT FROM READING
60.	140	0.024	
54.4	130	0.020	
48.9	120	0.16	
43.3	110	0.12	
37.8	100	0.008	
32.2	90		
26.7	80		
21.1	70		
15.6	60		0.008
10	50		0.012
4.4	40		0.016
-1.1	30		0.020
-6.7	20		0.024
-12.2	10		0.028
-17.8	0		0.032
-23.3	-10		0.036
-28.9	-20		0.040
-34.4	-30		0.044

NOTE: No correction is necessary when temperature is between 70°F (21.1°C) and 90°F (32.2°C), since the variation is not great enough to consider.

Specific Gravity Temperature Correction
Figure 301

D. Charge Battery (Bench) (Lead Acid Batteries)

NOTE: • Direct current, only, must be used; never use alternating current.

• During charging, the electrolyte level shall be kept at a minimum of 1/8" below split rings.

(1) The factory recommends that the constant current charging method be used. The battery may be charged at any rate of amperes that will not produce gassing or bubbling of the electrolyte and will not produce electrolyte temperatures in excess of 115°F (46.1°C). Generally, the battery is charged at 3 amperes until terminal voltage is constant for 3 consecutive hours.

E. Charge Battery (In Aircraft) (Lead Acid Batteries)

(1) Because of the poor regulation of most ground power units it is not recommended that batteries be charged in the aircraft. If it becomes absolutely necessary to charge the batteries in this manner, set all aircraft switches to OFF except battery switches. Plug a ground power source of 28 (±0.5) volts into the external power receptacle and monitor power unit and battery continuously.

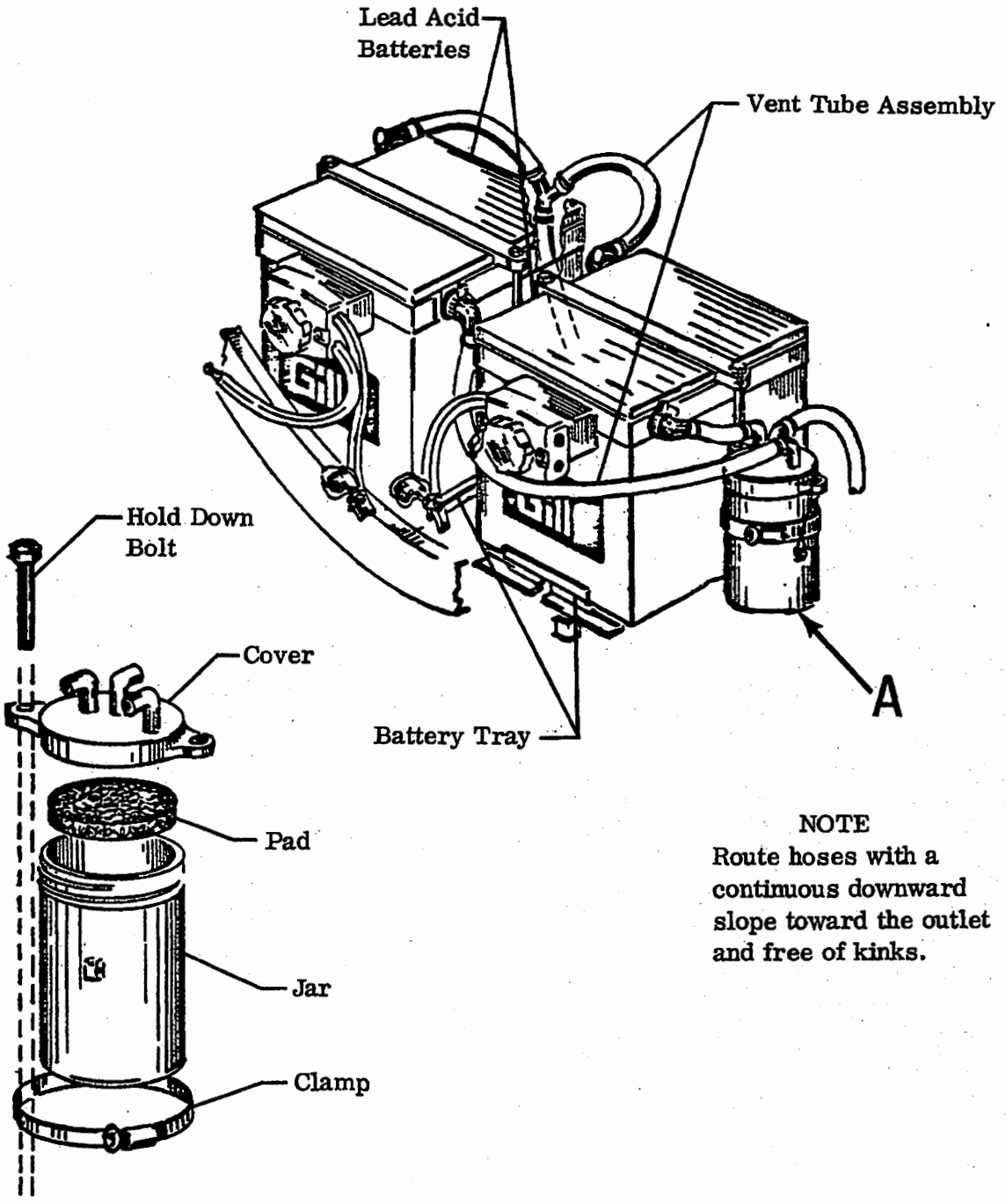
4. Servicing (Lead Acid Sump Jar and Vent Lines) (See figure 302.)

NOTE: Vent system and sump jar must be checked in accordance with time intervals specified in Chapter 5.

(1) Loosen clamp around sump jar, unscrew and remove sump jar and pad.
(2) Inspect acid neutralizing agent (baking soda). If neutralizing agent appears chunky and/or blue in color, replace it.
(3) Inspect pad. If pad shows signs of deterioration, replace it.
(4) Inspect drain and vent lines to be free of kinks or obstructions.

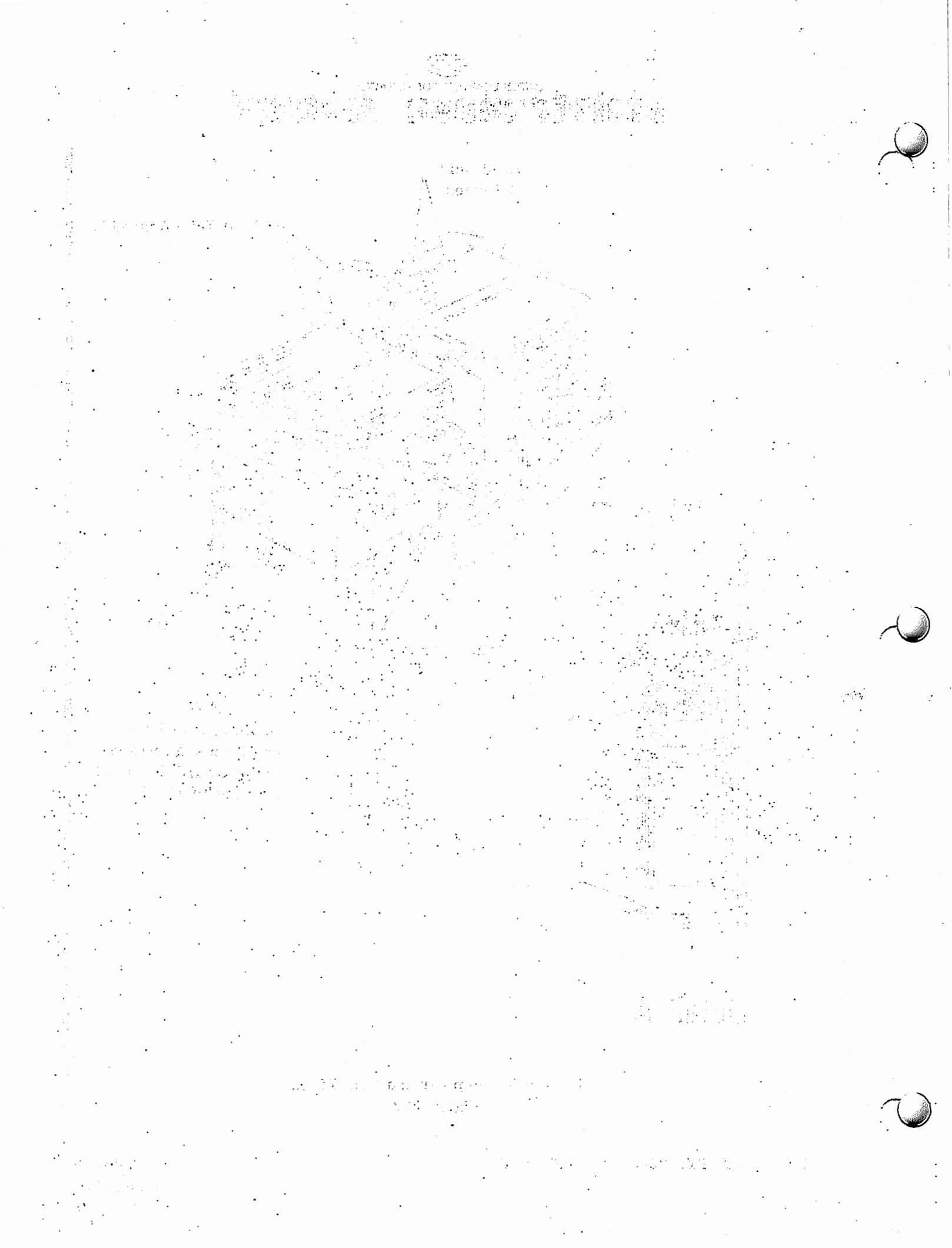
NOTE: Vent lines are color coded RED for positive vent and BLACK for negative vent. Note flow lines are installed before removing.

(5) Install pad and sump jar securely in place and tighten clamp.



NOTE
Route hoses with a continuous downward slope toward the outlet and free of kinks.

Lead Acid Sump Jar and Vent Lines
Figure 302



EMERGENCY BATTERY - SCHEDULED SERVICING

1. General
 A. Either a single or dual emergency battery is installed in the tailcone or the nose compartment sections.
 B. The emergency battery is rated at 25 vdc and 115 vac (+7/-10%) at 400 Hz.
 C. The emergency battery charge is maintained through normal 28 vdc power.
 D. To extend the service life of the emergency battery, the battery must be tested and charged at the time intervals specified in Chapter 5.

2. Servicing

 CAUTION: THE FOLLOWING TEST SHOULD BE PERFORMED ONLY ONCE DURING ANY SERVICE CYCLE OR TRANSISTOR DAMAGE COULD RESULT.

 NOTE: This emergency battery service cycle procedure should be reviewed completely prior to testing and charging.

 A. Emergency Battery Test and Charge Procedure. (See figures 301 and 302.)
 (1) Remove emergency battery from aircraft. Refer to 24-33-01.

 CAUTION: REMOVE 10 AMPERE FUSE (F2) PRIOR TO REMOVING COVER FROM BATTERY OR CIRCUIT DAMAGE COULD RESULT.

 (2) Remove attaching parts and cover from emergency battery.
 (3) Inspect battery pack for obvious signs of venting or corrosion. Replace defective cells before proceeding with test. (Refer to J.E.T. Operation, Installation and Maintenance Manual. Pub. No. TP-202.)

 NOTE:
 - Venting is a normal process in which the cell releases excessive internal pressure resulting from overheating. Venting is indicated by either a visible rupture near the top center of the cell or through the appearance of corrosion in the same area.
 - Before performing the remaining test, charge battery for 16 hours (figure 302) and allow approximately 4 hours between charging and testing to permit temperature stabilization.

 (4) Connect a 10 K ohm, 1/2 watt resistor and DC voltmeter to connector pins 11 (+) and 7 (-). The voltage should be between 20 and 28 vdc.

 CAUTION: DO NOT LEAVE 7.0 OHM LOAD CONNECTED FOR MORE THAN 5 SECONDS.

(5) Substitute a 7.0 ohm, 150 watt resistor for the 10K ohm, 1/2 watt resistor. If the initial voltage (voltage may start to increase in a few seconds) is greater than 5.0 vdc, stop test and check output transistors Q6, Q18, Q19, and Q20 for shorted elements. (Refer to J.E.T. Operation, Installation and Maintenance Manual, Pub. No. TP-202.)

(6) If the voltage in step (5) is less than 5 vdc, remove 7.0 ohm load and place a jumper across pins 11 and 13. Reconnect 7.0 ohm load to pins 11 and 7. The voltage should be 24.5 minimum.

(7) If voltage in step (6) is greater than 24.5 vdc, continue to discharge the battery while monitoring time and voltage (refer to figure 301). Check the following voltages while battery is discharging.
- (a) Pins 3 (+) to 7 (-) approximately 120 vac.
- (b) Pins 4 (+) to 7 (-) approximately 27 vac.
- (c) Pins 5 (+) to 7 (-) approximately 4.7 vac.
- (d) At the end of the discharge cycle, remove resistor and voltmeter and charge battery a minimum of 16 hours. Return to service.

(8) If voltage in step (6) is less than 24.5 vdc, perform step (9).

(9) Connect a 7 ohm, 150 watt load (resistor) and DC voltmeter across the battery. Monitor time and voltage (refer to figure 301).
- (a) If battery discharge follows figure 301, charge battery at 28 vdc (1.25 amperes) for a minimum of 16 hours (figure 302) and return to service.
- (b) If battery discharge does not follow figure 301, the battery must be deep cycle discharged to erase the Ni-Cad "memory" phenomenon. (Refer to step 10.)

(10) Replace the 7.0 ohm, 150 watt resistor with a 60 ohm, 20 watt resistor and continue discharge.

CAUTION: FAILURE TO SHORT A CELL AS IT DROPS BELOW +0.5 VDC ON A DEEP CYCLE DISCHARGE WILL ALLOW THE CELL TO BECOME REVERSED AND DAMAGE TO THE CELL COULD RESULT.

(11) Monitor the individual cells voltage during discharge. As each cell reaches +0.5 vdc connect a jumper across cell's negative and positive terminals shorting it out. (Jumper wires may be made from No. 16 bus wire or equivalent inserted from the bottom of the battery pack.)

(12) Continue with step (11) until all cells have been shorted out. Let battery stand in this condition for approximately 24 hours before continuing.

(13) Remove jumpers and charge battery at 28 vdc (1.25 amperes) for a minimum of 16 hours (figure 302). Repeat step (9).

NOTE: To achieve satisfactory discharge curve results the deep cycle may have to be repeated three times.

(14) If, after the third deep cycle, the battery pack discharge curve does not meet the requirements of figure 301, recharge the battery and perform step (15).

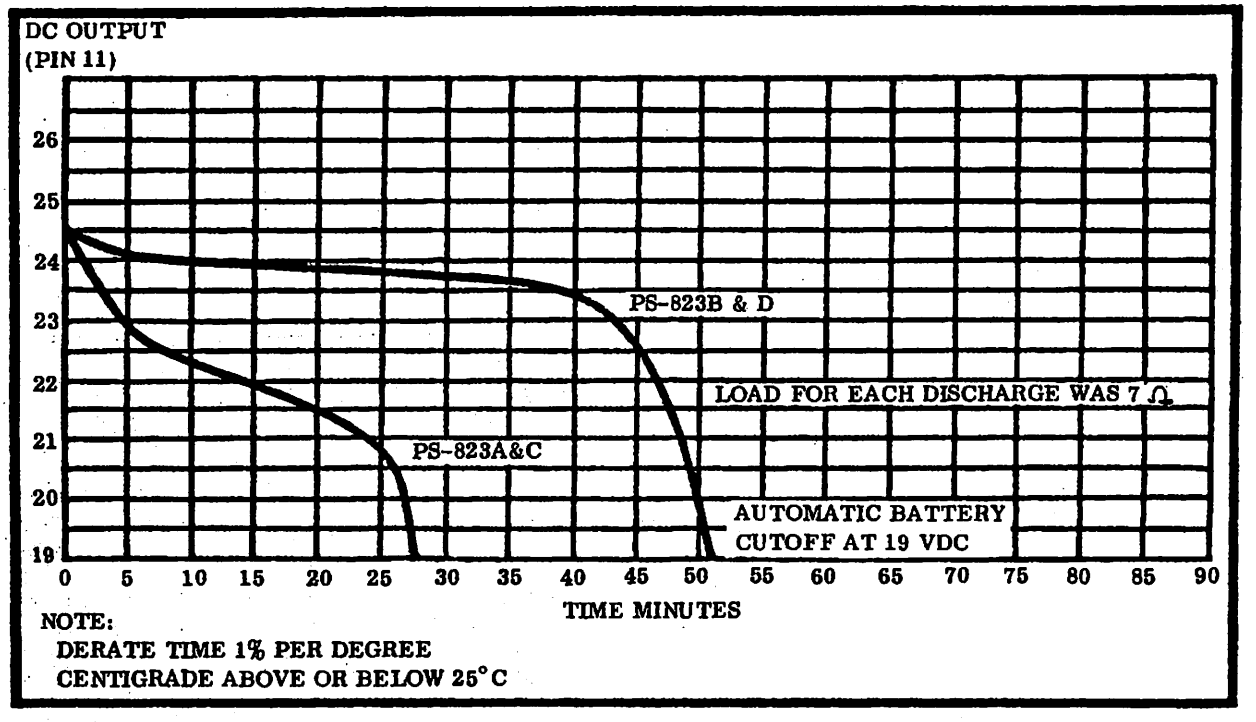
(15) Connect the 7.0 ohm load and DC voltmeter, and perform battery discharge curve check (figure 301). If discharge time is too fast, quickly check voltage of individual cells when battery voltage level reaches 20 vdc. Replace any cell(s) which indicated +0.5 vdc or less. Refer to J.E.T. Operation, Installation and Maintenance Manual, Publication No. TP-202. Repeat entire test if cell(s) are replaced.

B. Emergency Battery Storage

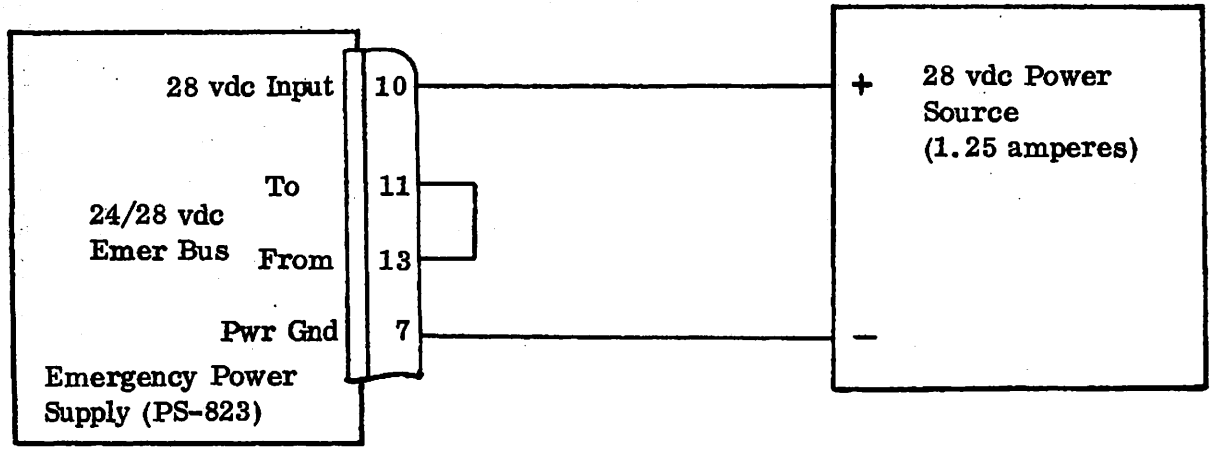
(1) If a ready condition of the battery is required it is recommended that every 15 days of storage the power supply be top charged for eight hours as in figure 302. (Constant trickle charging is not longer recommended.)

(2) For ready and non-ready conditions of storage perform Emergency Battery Test and Charge procedure every three months.

NOTE: It is recommended that the battery packs be placed through at least two deep cycles at least once per year. This will equalize uneven cells and aid in preventing "memory" buildup.



PS-823 Emergency Battery Discharge Curve (Nominal)
Figure 301



PS-823 Battery Charging
Figure 302

EMERGENCY EXIT AND WING INSPECTION POWER SUPPLY - SCHEDULED SERVICING

1. General
 A. The aircraft is equipped with two emergency exit and wing inspection power supplies. Each power supply consists of two sealed nickel cadmium batteries and a control circuitry module.
 B. To extend the service life of the batteries, the batteries should be submitted to a discharge-recharge reconditioning cycle in accordance with current inspection requirements.

2. Servicing
 A. Perform Emergency Battery Discharge-Recharge Reconditioning Cycle
 (1) Remove power supplies from aircraft. (Refer to Chapter 33.)
 (2) Remove batteries from each power supply. (Refer to Chapter 33.)

 CAUTION: TO MAINTAIN MAXIMUM RATED CAPACITY OF EMERGENCY BATTERIES, DEEP CYCLE CONDITIONING (TWICE DISCHARGING AND RECHARGING) OF EMERGENCY BATTERIES WILL BE OBSERVED.

 (3) Discharge each battery pack at a rate between 110 and 550 milliamps until voltage drops to 10 volts. Time required to fully discharge battery will depend upon current and state of charge.

 CAUTION: BATTERIES SHOULD NOT BE CHARGED ABOVE CURRENT RATE INDICATED IN STEP (4) OR BEYOND THE MAXIMUM TIME NECESSARY TO CHARGE A MAXIMUM OF 770 MILLIAMPERE HOURS. CHARGING RATES LOWER THAN PRESCRIBED CHARGING RATES WILL RESULT IN LOWER BATTERY CAPACITY. CHARGING RATES HIGHER THAN PRESCRIBED CHARGING RATES CAN RESULT IN DAMAGE TO THE BATTERY.

 (4) Charge each battery pack at a constant current rate between 45 to 55 milliamps. Charge time should be adjusted so that a total of approximately 770 milliampere hours is charged into battery. For example:
 45 milliamps for 17 hours, or
 50 milliamps for 15 hours, or
 55 milliamps for 14 hours.
 (5) Repeat steps (3) and (4), completing required deep cycle conditioning.
 (6) After batteries are fully charged, install batteries in emergency lighting power supply assembly and install assembly in aircraft.

DOWNED AIRCRAFT LOCATOR TRANSMITTER BATTERIES SCHEDULED SERVICING

1. General
 A. The Downed Aircraft Locator transmitter is equipped with eight nickel-cadmium batteries.
 B. To extend the service life of the batteries, the batteries must be submitted to a discharge-recharge reconditioning cycle in accordance with current inspection intervals. Refer to 5-10-03.

2. Servicing
 A. Perform Battery Discharge-Recharge Reconditioning Cycle
 (1) Remove downed aircraft transmitter from aircraft. Refer to 25-61-00.
 (2) Remove batteries from transmitter.
 (3) Check voltage of each individual battery. If voltage is 1.1 vdc or more proceed with step 5. If voltage is less than 1.1 vdc proceed with step 4.
 (4) Charge each battery individually or in a group of eight if all eight batteries are less than 1.1 vdc. Charge batteries using the following power sources and loads.
 (a) Single battery - use a 12 vdc power source; charge thru a 27 ohm, 5W load for one hour. Or, using a 24 vdc power source, charge thru a 62 ohm, 10W load for one hour.
 (b) Eight batteries - use 24 vdc power source; charge thru a 39 ohm, 10 W load for one hour.
 (5) Discharge each battery individually into a one ohm, 3W load until its on load terminal voltage is 0.25 vdc or less.

 NOTE: This discharge may require up to four hours if batteries are fully charged and in good condition.

 (6) Remove the discharge load and allow batteries to stand for two hours.
 (7) Measure the terminal voltage of each battery. If voltage is 1.0 vdc or less replace the battery(s). If voltage is more than 1.0 vdc charge the batteries for 20 hours at 24 vdc thru a 39 ohm, 10W load.
 (8) After 20 hours charging, immediately measure the off load terminal voltage of each battery. If 1.3 vdc or less, replace the battery(s). If more than 1.3 vdc, install batteries in transmitter and install transmitter in aircraft. Refer to 25-61-00.

GNS-500A STANDBY BATTERY - MAINTENANCE PRACTICES

1. Servicing

NAME	NUMBER	MANUFACTURER	USE
Load Resistor	0400C	Ohmite (or four 25 ohm, 50 watt resistors, connected in parallel)	Controlled discharge of battery.
DC Voltmeter (20-30 volt, 5% accuracy or better.		Commercially Available	Measure battery voltage.
Adjustable Power Supply (35 volt or more at 120 mA)		Commercially Available	Charge battery.

B. Battery Check

NOTE: A stored battery may require as many as three charge-discharge cycles to restore capacity. An in-service battery should require no more than two cycles to restore capacity. (Refer to steps (2), (3), and (4).) The following procedure will determine whether a battery is defective or simply discharged; it will also restore capacity of a stored battery.

(1) Remove the battery from the optional equipment unit (OEU). Allow battery temperature to stabilize at 77° ±9F (25° ±5°C).
(2) Discharge the battery into the load resistor until the terminal voltage is 22.0 volts.
(3) Adjust the power supply for a short circuit current of 120 mA, and a no-load voltage of 35 volts or more.
(4) Charge the battery for 14 hours.
(5) Disconnect power supply from battery and measure terminal voltage. If less than 27.5 volts, replace battery.
(6) If terminal voltage is 27.5 volts or greater, measure the time required to discharge the battery to 22.0 volts using the load resistor.
(7) If time required to discharge to 22.0 volts is 10 minutes or more, recharge the battery as in step (3) and place in service.
(8) If time required to discharge to 22.0 volts is less than 10 minutes, replace the battery.
(9) At this point a previously in-service battery or previously stored battery should be restored to capacity and fully charged per NOTE at start of the procedure.
(10) Install the battery in the OEU.

EXTERIOR - CLEANING

1. General
 A. The aircraft should be washed frequently in order to maintain its appearance and minimize corrosion. Lubricate aircraft components where necessary after washing.
 B. When it is desired to polish the aircraft exterior finish, the type of finish must first be determined. The aircraft is painted with either Corlar enamel or Alumigrip polyurethane enamel.
 C. Corlar enamel can be polished using either K-2 Wadpol High Speed Aircraft Polish or Dupont "7" Car Polish.
 D. Alumigrip polyurethane enamel can be polished using any good quality automotive wax. It is recommended that Alumigrip polyurethane enamel not be waxed for the first one or two years after being applied. Instead, washing with mild detergent and water will generally return luster to the polyurethane finish. The use of abrasive polish on Alumigrip polyurethane enamel will scratch and dull the finish.

2. Tools and Equipment

CLEANING METAL AND PAINTED SURFACES

NAME	NUMBER	MANUFACTURER
Aerowash A		Wyandotte Chemical Corp.
Greater Mountain Chemical	528-B	Greater Mountain Chemical Co.
Turco Air-Tee	No. 2	Turco Products
Cee Bee Alumaloy P		Cee Bee Chemical Co.

CARBON AND EXHAUST STAIN REMOVAL

NAME	NUMBER	MANUFACTURER
Navee 427		Pentone Chemical Division
Naptha (for diluting Navee 427)		

EXTERIOR POLISHING

NAME	NUMBER	MANUFACTURER
Good Quality Automotive Wax		Commercially Available

CLEANING ACRYLIC PLASTIC

NAME	NUMBER	MANUFACTURER
Mild Soaps & Detergents		Commercially Available
Plastic Cleaner	901-D	Acorn Adhesive Co.

3. Preparation for Cleaning
 A. For general exterior cleaning, dilute one part of the following cleaners with the indicated quantities of water by volume:

CLEANER	MODERATE SOILS	HEAVY SOILS
Wyandotte Aerowash A	3 to 7	3
Greater Mountain Chemical 528B	3 to 7	3
Turco Air-Tee No. 2	3 to 7	3
Cee Bee Alumaloy P	3 to 7	3

CAUTION: THE UNDILUTED CONCENTRATE SHOULD NOT BE ALLOWED TO CONTACT PLASTIC WINDOWS AND/OR COVERS. PLASTIC IS CRAZED BY THE UNDILUTED CONCENTRATE.

 B. For removing carbon, exhaust stains and other heavy duty applications, dilute Navee 427 with the indicated quantities of water or naptha by volume.

SOILS	DILUTE ONE PART BY VOLUME NAVEE 427 TO THE FOLLOWING PARTS WATER OR NAPTHA
Carbon Stains	Full Strength
Exhaust Stains	3 to 4 parts naptha or 1 to 5 parts water.
Grease and Oil	3 to 7 parts naptha
Flap Wells and Wheel Wells	5 parts water
General Heavy Duty Cleaning	5 to 10 parts water

C. Close all openings such as passenger/crew door.
D. Cover the tires. Do not allow tires to stand in pools of cleaning solution any longer than required for the washing operation
E. Cover static ports and pitot ports to prevent water and cleaning solution from entering.
F. Cover lubricated parts to prevent water and cleaning solution from entering.
G. Mask off antennas with polyethylene sheeting or aluminum foil tape.

4. Cleaning Exterior

CAUTION: AVOID EXCESSIVE SPRAY ON ELECTRICAL CONDUITS, ELECTRICAL UNITS, OR READILY ABSORBENT MATERIALS.

A. Method of Application
(1) Use nonatomizing spray equipment.
(2) Use soft bristle fiber brushes. Presoften brushes by soaking in the cleaning solution.
(3) Allow cleaner to soak for 5 to 10 minutes; however, do not allow cleaner to dry on the surface before rinsing as staining may result.
(4) Reapply the solution with a brush and scrub where necessary.
(5) Pressure wash all surfaces contacted by the cleaner thoroughly with fresh water, preferably warm (120° to 140°F).

B. Cleaning Acrylic Windows
(1) Remove loosely adhering dirt and grit from the window by flushing with water filtered free of dirt and abrasive materials.
(2) Wash with nonabrasive soap and water. A soft, thoroughly clean cloth, sponge, or chamois may be used in washing but only as a means of carrying the soapy water to the plastic. Go over the surface only with the bare hand so that any abrasive can be quickly detected and removed before it scratches the plastic surface.

CAUTION: RUBBING THE PLASTIC SURFACE WITH A DRY CLOTH WILL CAUSE SCRATCHES AND BUILD UP AN ELECTROSTATIC CHARGE WHICH ATTRACTS DUST PARTICLES. ALL RUBBING OPERATIONS ON ACRYLIC PLASTICS SHALL BE DONE WITH AS LIGHT A PRESSURE AS POSSIBLE.

(3) Dry the window with a clean, damp chamois. A clean, soft cloth or tissue may be used if care is taken not to rub the plastic after it is dry.
(4) Remove oil and grease by rubbing lightly with a cloth wetted with aliphatic naptha.

CAUTION: DO NOT USE THE FOLLOWING MATERIALS ON ACRYLIC PLASTICS: GASOLINE, ALCOHOL, BENZENE, HEXANE, XYLENE, ACETONE, CARBON TETRACHLORIDE, FIRE EXTINGUISHER, OR DE-ICING FLUIDS, LACQUER THINNERS, OR WINDOW CLEANING SPRAYS, AS THEY SOFTEN THE PLASTIC AND/OR CAUSE CRAZING.

C. Cleaning Radome

(1) Remove insect residue from radome with mild detergent diluted with water.

NOTE: Insure complete removal of detergent after cleaning to prevent staining and possible paint removal.

INTERIOR - CLEANING

1. General
 A. The aircraft interior should be frequently cleaned to maintain its appearance and minimize deterioration.

2. Tools and Equipment

NAME	NUMBER	MANUFACTURER
Orvus WA Paste		Commercially Available
Lissapol	1132	Imperial Chemical Industries
Wich Torlan		Wichita Brush and Chemical Co.
Mineral Spirits	Apco No. 10	Commercially Available.
Cheesecloth		Commercially Available.
Bon Ami		Commercially Available.

3. Cleaning Interior

CAUTION: DO NOT USE ABRASIVE CLEANERS, PARTICULARLY THOSE CONTAINING BLEACHES ON ANY INTERIOR DECORATIVE SURFACE. ABRASIVE CLEANERS WILL DESTROY SILK-SCREENED DESIGNS, DAMAGE COLORED LEATHERS, PAINTED SURFACES, AND PLASTIC SURFACES. AVOID USING ORGANIC CHEMICALS, PARTICULARLY KETONES, ESTERS, AROMATIC AMINES, NITRO COMPOUNDS AND HYDROCARBONS OR CLEANERS WHICH MAY CONTAIN THE ABOVE CHEMICALS. AVOID USING MATERIALS SUCH AS FIRE EXTINGUISHER FLUIDS, DE-ICING FLUIDS, PAINT STRIPPERS, LACQUER THINNERS, OR HYDRAULIC FLUIDS.

A. Cleaning Rugs, Leather, and Fabrics except Suede Leather
 (1) Mix 2 ounces of Orvus paste per gallon of water.
 (2) Use only the foam for cleaning.
 (3) Sponge foam on the surface. Do not get surface too wet.

B. Cleaning Suede Leather
 (1) Mix a mild soap solution.
 (2) Use a fine wire brush and soap solution to remove stain.

C. Cleaning Plastics or Metal Surfaces

CAUTION: DO NOT USE THE FOLLOWING MATERIALS ON DECORATIVE PLASTICS: GASOLINE, ALCOHOL, BENZENE, HEXANE, KEROSENE, XYLENE, ACETONE, CARBON TETRACHLORIDE, FIRE EXTINGUISHER OR DE-ICING FLUIDS, LACQUER THINNERS, OR WINDOW CLEANING SPRAYS.

(1) Mix 1 tablespoon Orvus paste per gallon of water.
(2) Wash the surface with cloth.
(3) Rinse the surface with clean water and wipe dry.

D. Cleaning Acrylic Windows

(1) Remove loosely adhering dirt and grit from the window by flushing with water filtered free of dirt and abrasive materials.
(2) Wash with nonabrasive soap and water. A soft, thoroughly clean cloth, sponge, or chamois may be used in washing, but only as a means of carrying the soapy water to the plastic. Go over the surface only with the bare hand so that any abrasive can be quickly detected and removed before it scratches the plastic surface.

CAUTION: RUBBING THE PLASTIC SURFACE WITH A DRY CLOTH WILL CAUSE SCRATCHES AND BUILD UP AN ELECTROSTATIC CHARGE WHICH ATTRACTS DUST PARTICLES. ALL RUBBING OPERATIONS ON ACRYLIC PLASTICS SHALL BE DONE WITH AS LIGHT A PRESSURE AS POSSIBLE.

(3) Dry the window with a clean, damp chamois. A clean, soft cloth or tissue may be used if care is taken not to rub the plastic after it is dry.
(4) Remove oil and grease by rubbing lightly with a cloth wetted with aliphatic naptha.

CAUTION: DO NOT USE THE FOLLOWING MATERIALS ON ACRYLIC PLASTICS: GASOLINE, ALCOHOL, BENZENE, HEXANE, XYLENE, ACETONE, CARBON TETRACHLORIDE, FIRE EXTINGUISHER, OR DE-ICING FLUIDS, LACQUER THINNERS, OR WINDOW CLEANING SPRAYS, AS THEY SOFTEN THE PLASTIC AND/OR CAUSE CRAZING.

E. Cleaning Lower Tailcone Area

(1) Remove foreign material from structure beneath batteries and surrounding area with APCO No. 10 Mineral Spirits or equivalent.

CAUTION: REMOVE BATTERIES FROM AIRPLANE WHEN WASHING DOWN THIS AREA. TRICHLORETHYLENE OR ANY DEGREASING SOLVENT WILL REACT WITH POLYSTYRENE BATTERY CELL CASES AND CAUSE PERMANENT DAMAGE.